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Students Extended Abstracts

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Contents

LEARNING OBJECTS PERSONALISATION APPLYING SEMANTIC WEB METHODS AND TECHNOLOGIES

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Your Brief Biograpfy

During 3 years of studies, the research was presented at 9 conferences:

1. e-Learning'15 , 2015 -09-12, Berlin, Germany.
2. ICIST'2015, 2015 -10-15, Druskininkai, Lithuania.
3. ALTA'2015, 2015 -05-19, Kaunas, Lithuania.
4. Kess-SEEL'2015, 2015 -06-19, Sorento, Italy.
5. ICIST'2015, 2016 -10-15, Druskininkai, Lithuania.
6. ALTA'2016, 2016 05-19, Kaunas, Lithuania.
7. Kess-SEEL'2016, 2016 06-17, Tenerife, Ispanija.
8. Kess-SEEL'2017, 2017-06-23, Porto, Portugalija.
9. LIKS'2017, 2017 09-23, Kaunas, Lithuania.

The research presented in the scientific international journals during 3 years of studies:

1. Gudonienė, Daina; Maskeliūnas, Rytis; Rutkauskienė, Danguolė. The model for learning objects design based on semantic technologies // International journal of computers, communications and control. Bihor: CCC Publications. ISSN 1841-9836. 2017, vol. 12, iss. 2, p. 227-237. [Science Citation Index Expanded (Web of Science); Scopus]. [IF: 1,374; AIF: 2,682; IF/AIF: 0,512; Q3; 2016 Journal Citation Reports® Science Edition (Thomson Reuters, 2017)].
2. Gudonienė, Daina. Mokymosi objektų kūrimo įrankiai, priemonės ir skirtingi mokymosi objektų modeliai e. mokymuisi. ALTA'16 : Pažangios mokymosi technologijos : konferencijos pranešimų medžiaga, 2016 m. gegužės 19 d. = Advanced learning technologies : conference proceedings, 19th of May, 2016 / edited by p. 71-78.
3. Dagienė, Valentina; Gudonienė, Daina; Burbaitė, Renata. Semantic web technologies for e-Learning: models and implementation // Informatica. Vilnius: Institute of Mathematics and Informatics. ISSN 0868-4952. 2015, vol. 26, iss. 2, p. 221-240. [Science Citation Index Expanded (Web of Science); Inspec; MatSciNet; Scopus; Zentralblatt MATH]. [IF: 1,386; AIF: 1,349; IF/AIF: 1,027; Q1; 2015 Journal Citation Reports® Science Edition (Thomson Reuters, 2017)].

4. Dagienė, Valentina; Gudonienė, Daina. The innovative methods for massive open online course design // Baltic journal of modern computing. Riga: University of Latvia. ISSN 2255-8942. 2015, vol. 3, iss. 3, p. 205-213. [Emerging Sources Citation Index (Web of Science); Directory of Open Access Journals (DOAJ)].
5. Rutkauskienė, Danguolė; Gudonienė, Daina. Innovative technological solutions for blended learning approach // Smart digital futures 2014 : KES international conference on smart digital futures (SDF), Chania, Greece, June 18-20, 2014 / Edited by: R. Neves-Silva, G.A. Tsihrintzis, V. Uskov, R.J. Howlett, L.C. Jain. Amsterdam: IOS Press, 2014. (Frontiers in artificial intelligence and applications, 262, ISSN 0922-6389), ISBN 9781614994046. p. 697-705. [Conference Proceedings Citation Index].

Research area description

The research presents ***a problem*** of using semantic terms and the need for the use of semantic technologies in the development of training facilities by using learning objects. The teacher's community express a need to have their own concepts in the field, as one of the essential elements in the field of education. The question is how to improve and enrich the training courses by using semantic learning objects (SLO).

PROBLEM:

Existing models don't assure effective e-learning objects (ELO) design, search in semantic web and adaptation, as well as there is no suggested model, which will assure ELO adaptation in semantic web and automatically will integrate ELO to be re-used.

AIM:

To develop multifunctional e-learning objects design, search and adaptation model, that will assure similar content ELO search in semantic web and will make more effective ELO design and adaptation process.

OBJECTIVES:

1. *to analyse existing ELO design, search and adaptation models, based on semantic web technologies*
2. *to design ELO design search and adaptation model based on semantic web technologies*
3. *to suggest the templates for ELO design*
4. *to organize exploitation of the model and to provide the conclusions*

NOVELTY:

E-Learning objects designers can generate object search in object creation environment in semantic web and this search is directly focused on special open- educational resources storage, search for them and finds similar content LO, later including them to the course and adapting according to the user's needs.

SCIENTIFIC RESULTS:

1. After analysis of existing ELO design, search and adaptation models, based on semantic web technologies there was developed conceptual framework for learning objects design, search and adaptation in semantic web.

2. Developed ELO design, search and adaptation model based on semantic web technologies. Multifunctional ELO design, search and adaptation model gives a possibility to users effectively to create ELO, to search similar content, or to adapt already existing ELO.
3. The template for ELO design was developed based on semantic technologies and the main feature of LO – re-usability

For sharing reusable learning objects, repositories are required so that these learning objects could be stored and delivered. A variety of learning object repositories are existing, however metadata studies show that the majority of metadata of currently existing LO repositories is only a general description of the content and settings. Such data is difficult to use for program agents. Therefore, it is important to create semantic relations in the repositories so that learning objects would be fully integrated and linked.

A presentation of any preliminary ideas, the proposed approach and achieved results

A systematic review of the related research works and analytical research methods were used for revealing the advantages of the use of semantic web technologies in e-learning and for raising issues related to the semantic learning objects' use in semantic education as well as for exploring existing LOs design approaches and models and for extracting initial data from our model linked to a theoretical framework.

Descriptive research was used: (1) to explain created integrated environment (LOR) architecture; (2) to evaluate the theoretical relevance; (3) to present the results of the experiment.

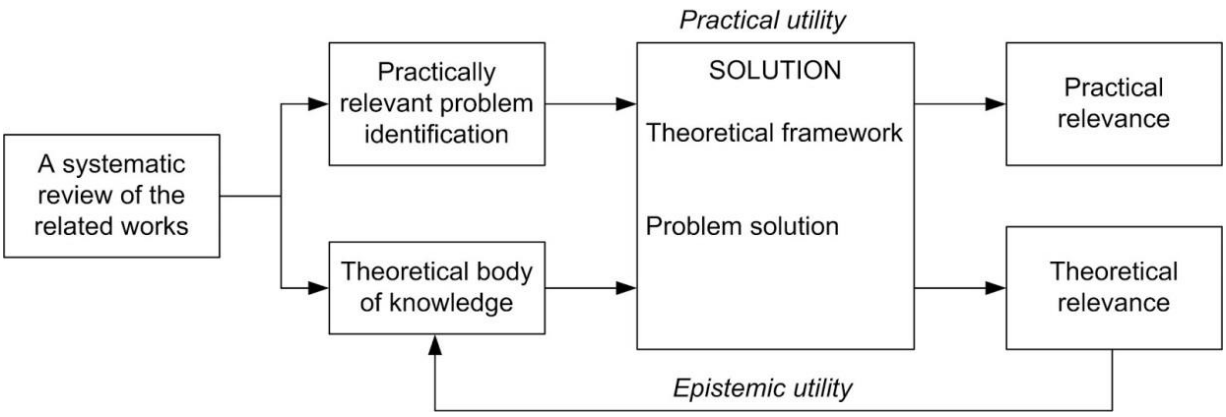

Figure 1. Constructive research approach diagram

During the research, an important of LOs composed of content elements with semantic relations, automatic generation before it describes the content elements with semantic relations identified.

The developed a framework for integrated environment for learning objects design and storing in semantic web (fig.2).

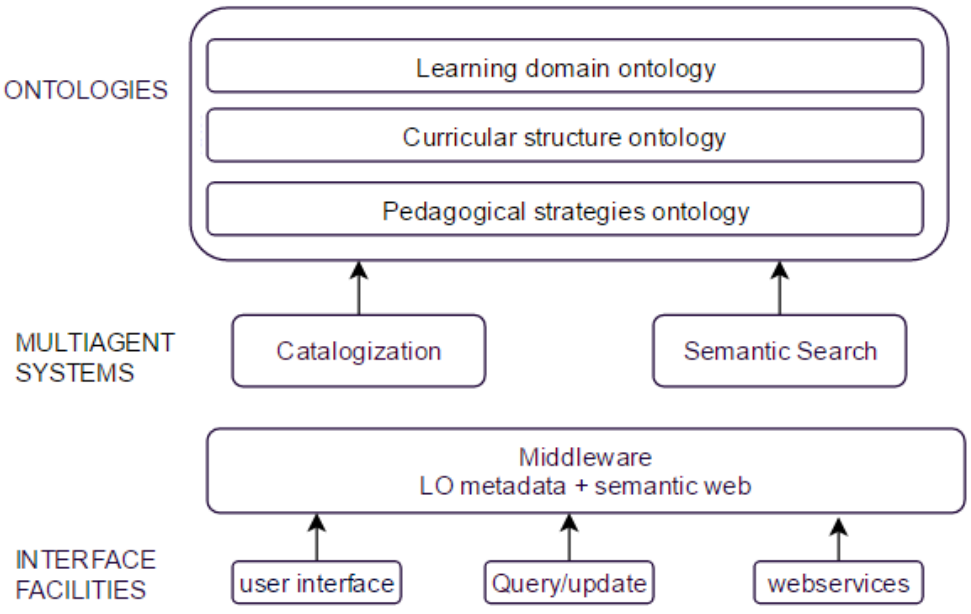

Fig.2. Integrated environment for learning objects design and storing in semantic web.

Semantic network software agents can use contractual language service that allows agents to work together and actively introduce the learning material in the context of current problems. The aim is to create links between learning objects and semantic network is very important in LO search, adaptation or improvement.

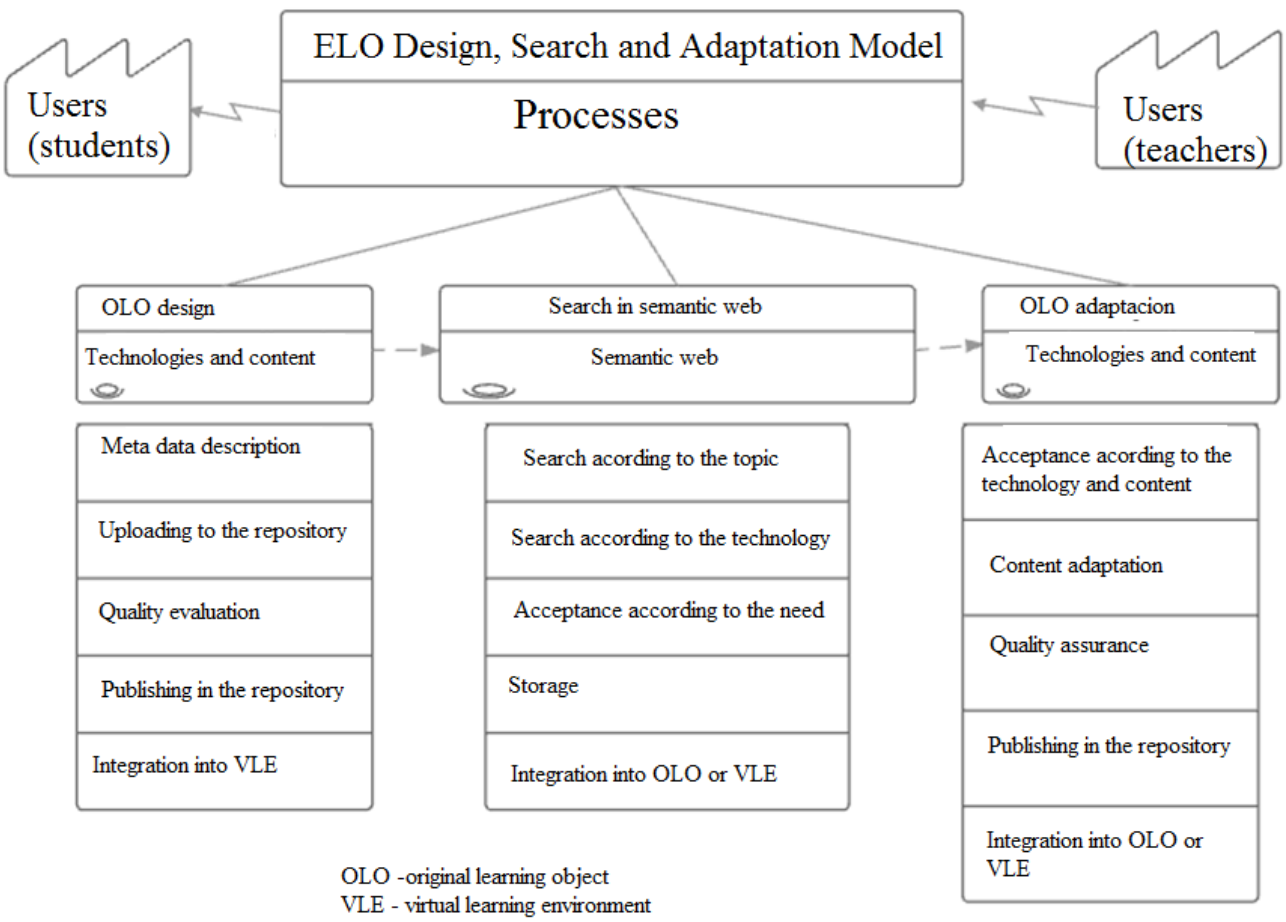

Fig. 3. ELO design, search and adaptation model.

Search LO in the semantic web is assured by relations with external repositories of open educational resources, giving open access to it. In a search in the semantic web the meaning of the words used in the query is considered in the search process what involves, for instance, the understanding of the intention of the user and the context of the search term, either on the newly designed LOR.

The model is based on 3 very important processes: OLO design, search and adaptation.

Expectations and motivation to attend Doctoral Consortium

I have a great experience of the preview year and hope again to have a nice co-operation with the professional in my research area.

INTEGRATING THE 4PS OF CREATIVE LEARNING AND THE 5ES OF FRAMEWORK OF ACTION TO INCULCATE THE CULTURE OF COMPUTATIONAL THINKING IN INTERDISCIPLINARY LEARNING AND TEACHING

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Your Brief Biography

Loice Victorine Atieno an ICT teacher/ lecturer at higher learning institution. She has worked in this capacity for fourteen years where she has gained immensed experience as a reacher/ lecturer/ instructor, adminstrator, team leader and project cordinator. Her main interest is in making learning more innovative and intereting to the learner. She is an advocate of learner centered approach to teaching. She has Presented a conference paper entitled:" Successful Implementation of Digital Village Projects: A Key Factor to Economic Empowerment at the Community Level" and did a publication entitled "Implementation of Digital Village Projects in Developing Countries - Case of Kenya. *British Journal of Applied Science & Technology - 4(5): 793-807, 2014. "Available* online: http://www.sciencedomain.org/issue.php?iid=361&id=5
She has a bachelors degree in education, a higher diploma and masters degree in Information systems and currently she is persuing her Phd degree at Eotvos Lorand University (ELTE) in the field of education innovation under the faculty of informatics

Research area description

The main problem you are trying to tackle and its relevance

Education systems around the world have remained the same despite the many changes taking place in various sectors. Most schools in most countries place a higher priority on teaching students to follow instructions and rules (becoming A students) than on helping students develop their own ideas, goals, and strategies (becoming X students) (Resnick, 2017). For people to flourish in this rapidly changing landscape, the ability to think and act creatively is more important than ever before. The biggest question here is "how can we help young people develop as creative thinkers so that they're prepared for life in this ever-changing world?" Resnick (2017)
The Creative learning (the 4Ps) centers more on project creation through passion. The ScratchMaths project has injected CT into learning mathematics but Papert (1980) believes that learners should use computers to explore their thinking processes and this should not apply to mathematics only but to other subjects as well. Therefore the same concept should be applied to the learning and teaching of other subjects as well and this therefore forms the basis for this research.

The aim of research

The research aims at integrating the 4Ps (**P**roject, **P**assion, **P**eer and **P**lay) of Creative Learning with the 5Es (**E**xplore, **E**xplain, **E**nvisage, **E**xchange and bridg**E**) of framework of Action to inculcate the culture of computational thinking in learners in interdisplinary teaching and learning

An outline of the current knowledge of the problem domain (What is the state-of-the-art in relation to existing solutions to the problem)

There are calls in the 21st century for overall redefinition of the forms of knowledge, skills and competences that are necessary for the advancement of our societies (Palts & Pedaste, Undated). To realize these calls, the culture of Computational Thinking (CT) needs to be adapted. Wing (2010), describes CT as the new literacy of the 21st century. CT should not be considered as a skill for computer scientists only but an essential skill for everyone. Wing (2006), argues that CT should be considered as part of every child's analytical ability like reading, writing and even arithmetic. CT can be defined as the thought processes involved in formulating problems (Aho, 2012; Denning, 2009; Wings, 2006) and their solutions so that the solutions are represented in a form which can be

effectively carried out by an information processing agent (Wing, 2006). It also involves looking for algorithms to perform the conversions (Aho, 2012; Denning, 2009; Hoffmann, 2009). The information processing agent can be a computer, a machine or a human being (Wing, 2006).

According to Seymour Papert, when thinking of technologies to support learning and education the importance of "low floors" (easy ways for novice to get started) and "high ceilings" (ways for the learners to work on more complex projects with time) should be emphasized (Resnick, 2017). Programming languages such as Scratch (formerly the LOGO-like environments), which was used in the MIT Lab clubhouse, emphasizes on these two concepts. They also emphasize on the "wide walls" (programming language that offers a wider variety to be able to cater for a wider range of learners' interests) (Resnick, 2017).

Apart from using Scratch programs for developing passion, they can also be used in enhancing problem-solving, critical-thinking skills and also application of the learnt solutions into new problem. This leads to the concept of CT. According to Resnick (2017), the Scratch projects are propelled by four guiding principles: *project*, *passion, peer* and *play* known as 4Ps of creative learning.

Projects*:* development of projects is the core activity in the Scratch community.

Passion*:* People working on projects they care about hence dedicating more time and ideas into it.

Peers*:* creativity is viewed as a social process, with people collaborating, sharing, and building on one another's work. Scratch is designed for social interaction.

Play*:* Scratch is designed to support playful experimentation as a pathway to creativity, encouraging young people to take risks and try new things.

Learners should use computers to explore their thinking processes, Papert (1980) that is getting to know what can or cannot be done. The use of 4Ps encourages the idea of Constructivism approach to learning. The approach sees learning through design activities (Brennan 2015), which provide opportunities to explore ways to deal with different constraints and ambiguity by employing skills such as iterative thinking, problem solving and creativity. It encourages development and supports activities that allow learners to investigate ideas, try things out *for themselves* and debug conceptual and technical errors where necessary. The approach is geared towards encouraging students to 'taking control of their own learning' and to seek out the reasons behind different outcomes. Scratch has been used in learning as demonstrated in the ScratchMaths (SM) Project.

Findings of Scratch Math CSM) Project

The SM project was set out to exploit the recent commitment to programming in schools in England for the benefit of mathematics learning and reasoning. It aimed at introducing learners (age 9-11 years) to computational thinking as a medium for exploring mathematics following a constructionist approach. The focus was on two tensions which can arise within constructionist learning environments which were related to the tool and learning **(**the accessibility of the programming *tool,* and the process of *learning* through programming using the tool) and direction and discovery (balancing exploration and guidance). The project described how these tensions were addressed through the design of the SM curriculum which was based on the 5Es of the Framework of Action (**E**xplore, **E**xplain, **E**nvisage, **E**xchange and bridg**E** known as the ***five constructs***.

Explore Construct looked at how computers can be used to explore thinking processes to discover what can or cannot be done (Papert, 1980)

Explain Construct investigated the importance of incorporating reflective questions and opportunities for discussion with peers as well as whole-class interactions orchestrated by the facilitators. Being able to answer questions from the peers hence the cognitive benefit of generating verbal explanations (Harel & Papert 1990)

Envisage Construct showed that the link between the idea and the Learner's intuitive knowledge is seen as key in understanding the power of the idea (Papert 2000). There is need for some learning activities to be conducted prior to exploration with the programming tool. This provides learners with the opportunity to consider the program goal and to predict the potential outcomes of using different strategies.

Exchange Construct proved that collaboration and sharing are powerful ways of learning hence Han & Bhattacharya (2001), advocating for the development of ideas through interactions with others.

BridgE showed that powerful ideas should be embedded in any well-designed constructionist activity (Bers et al. 2014), and ideas are seen as powerful partly through their connections with other disciplines, such as mathematics (Papert 2000), and partly by virtue of the language in which they are expressed.

Advances beyond the state-of-the-art in terms of your specific contribution and research plan (A description of the Ph.D. project's contribution to the problem solution)

This is a research draft aimed at a fulfillment of a doctoral degree. The research will be based on the constructs developed from the integration of the 4Ps of Creative Learning and 5Es of Framework for Action. *Play* in the 4Ps is the same as *explore* in the 5Es. Learners are given a chance to explore and discover their talents and the best way is through play. In most cases they will choose what they like doing or the game they like playing. Therefore *passion* is also incorporated. The three constructs in this project will be combined and renamed **Explore** and **Discover.** As they are exploring, they are dealing with particular activity and therefore *projects* are being worked on inform of activities or they are the end results of the activities. The construct **Project** will remain as it is.

Getting to understand what one is working on and what the expected end results are is also important. The learners should not be left to work blindly and therefore some learning needs to take place at the beginning of the project hence the construct **Envisage** which will also remain in this project. The learners are also encouraged to work in groups to be able to assist each other. They will be working as peers, exchanging ideas and seeking explanation on issues that they don't understand therefore the construct *peer*, *exchange* and *explain* can be put together and be named **collaboration.** *BridgE* is the transfer of the ideas to other disciplines. The Construct **Bridge** will also remain and new construct **facilitation** will be added to ensure the learners remain focused if the whole concept of CT is to be achieved. The above named constructs will be used to demonstrate how CT can be injected into learning across different subjects

A presentation of any preliminary ideas, the proposed approach and achieved results

This research will be based on design approach. Design research comprises multiple cycles, which involve a number of different design and research activities. These activities are divided into three distinct phases according to Nieveen & Folmer (2013): preliminary research phase, prototyping or development phase and summative evaluation phase.

Preliminary research phase: Review of relevant literature will be carried out to give more insight into way of identifying CT in computing activities. This project will be carried out at ELTE T@T lab which is an innovation lab and is well designed for such activities. There will also be need to collect the relevant tools and activity types required for the interdisciplinary project. The expected outcome will be well developed guide based on the above constructs to be used to come up with the activities.

Prototyping: This will involve specifying overall description of the research project, outlining activities needed to be carried out based on the guide, build a fully specified subset of the activity content and support materials to be used for trial in the clubhouse and carryout iterative informative evaluation of the activities. The outcome will be a complete product for the first phase of the research.
Summative evaluation phase: Trial of the complete product within the clubhouse. The outcome will be a comprehensive report on the intentions of the first phase, challenges that need to be addressed and the recommendations for redesigning the product for attaining better results.
Multiple cycles of the design research would lead to a final product that could be distributed.

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Expectations and motivation to attend Doctoral Consortium

As a doctorial student at the starting point i believe doctoral consortium is a good opportunity to help propell my research towards the goal. It will provide me with an opportunity to explore and develop my research interest under the guidance of a panel of distinguished researchers. It will also provide me with an opportunity to share my research interest with students in a similar situation as well as senior researchers in the field.

LEARNING PROCESS ASSESSMENT CONTINUOUS MODEL CREATION AND VALIDATION

Oleg Mirzianov

years of study 2017-2021

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Your Brief Biography

Studies at Vilnius University

- PhD, Informatics Engineering (2017 – 2021),
- Master's degree, Computer Software Engineering (2016),
- Bachelor's degree, Computer Software Engineering (2014).

Interests

Education, lecturing at Vilnius University:

- Computers' Architecture,
- Human–Computer Interaction,
- Data Base Management Systems,
- Algorithms and Data Structure,
- C# application.

Publications

Justinas Marcinka, Oleg Mirzianov, Antanas Mitašiūnas „Learning Process Maturity Model“, Springer #477, 261-267 p., 2014 m.

Oleg Mirzianov, Antanas Mitašiūnas „Continuous Learning Process Assessment Model“, CEUR-WS #1368, 55-62 p., 2015 m.

Oleg Mirzianov, Saulius Ragaišis, Antanas Mitašiūnas „Learning process assessment and improvement“, BIR-WS #1684, 2016 m.

Oleg Mirzianov, Antanas Mitašiūnas, Leonids Novickis, Saulius Ragaišis „Development and Validation of Learning Process Assessment Model“, Procedia Computer Science #104, 258-265 p., 2017 m.

Research area description

- Learning activity assessment and improvement.
- Creation of learning process assessment continuous model, defining learning process quality characteristic, which is compliant with software engineering international ISO/IEC 330xx standard series requirements for process and quality dimensions, and description of learning activity in process orientated terms along with model validation.
- Attempts of creating and validating learning process assessment continuous model was done before as first steps.

- The Ph.D. project's contribution outcome is seen as complete and validate learning process assessment continuous model, which can be used for purpose of learning process assessment and improvement.

A presentation of any preliminary ideas, the proposed approach and achieved results

- A pilot learning process assessment continuous model was created and partially validated with students of Vilniaus university. The learning process assessment continuous model itself was created by tailoring ISO/IEC 330xx family of standards requirements and Robert Marzano learning taxonomy, proposing consciousness as quality characteristic.

Before creation the model two assumption was made:

1) Learning is a process orientated activity, therefore in can be modeled with ISO/IEC 33xx requirements.

2) Measurement characteristics for learning process assessment is "consciousness", therefore a new quality characteristic in process modeling is proposed.

The partial validation was carried out by assessing students learning process and comparing it to the marks they received from examination which mend to assess their ability to apply knowledge and capabilities. Logic behind this validation was that if a learner's learning process consciousness level is high, then the outcome (marks) that is being assessed during their exams will be high and vice versa.

The partial validation results gave evidence that there is connection between high mark and learner's high learning consciousness level. Further model revision and validation must be carry out with bigger amount of learner's, from different disciplines. Learning process improvement model should be created and adapted in assessment to see if improving learning process consciousness will improve marks.

Expectations and motivation to attend Doctoral Consortium

Motivation arise from having opportunity to present current work and future plans for purpose of expecting feedback from experienced researchers and critics to improve working process and achieve quality results.

MODEL OF FUNDAMENTAL INFORMATICS CONCEPTS EDUCATION

Gabrielė Stupurienė

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Your Brief Biography

From 2014 she is doctoral student of technological sciences (informatics engineering) at the Vilnius University Institute of Mathematics and Informatics. She has developed and defended her master thesis "Conceptualization of Informatics Fundamentals through Tasks" in 2011 in Vilnius University Faculty of Mathematics and Informatics. The main research interests include computational thinking, gender and computer science education. She has published several research papers also she has participated in a number of national projects.

Selected publications from 2016 - 2017 years:

Dagienė, Valentina; Stupurienė, Gabrielė; Vinikienė, Lina; Žakauskas, Rimantas. Introduction to Bebras challenge management: overview and analyses of developed systems // LNCS, Vol. 10696. ISSN 0302-9743. Cham : Springer International Publishing, 2017. ISBN 9783319714837. [12 p.].

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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. Prieiga per internetą: <http://www.bjmc.lu.lv/fileadmin/user_upload/lu_portal/projekti/bjmc/Contents/5_2_02_Benaya.pdf>.

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Research area description:

The main problem is how to keep balance between technology and science, because students needs both: learn informatics concepts and build their own programs (code).

Research object are fundamental informatics concepts.

The aim of research is by using the functional modeling method, to identify the basic set of fundamental informatics concepts for school students and develop a model for a concept-based informatics education.

Research objectives:

To analyze literature related with informatics education based on fundamental concepts for primary and secondary school and determine the problems;

To identify the basic set of fundamental informatics concepts by using the functional modelling method;

To describe two-dimensional categorization system (incorporate computational thinking skills categories and fundamental informatics concepts) for informatics learning tasks.

To develop the model of informatics education based on fundamental informatics concepts;

To perform expert evaluation of the developed model for informatics education at school.

Background: The concept can be understood as extensive information on a particular object, existing in human mind. The content of a concept can vary a lot as it depends on personal experience. Concepts of informatics are tightly related with our intensions: what we would like to teach at school. Concepts of informatics play a central role in all curricula and standards for informatics education at secondary schools. In practice at schools however very often the training of skills in application software is given much more room than the understanding of fundamental concepts of informatics. The curricula of informatics education must be not overload of notions and concepts that pupils must know and understand.

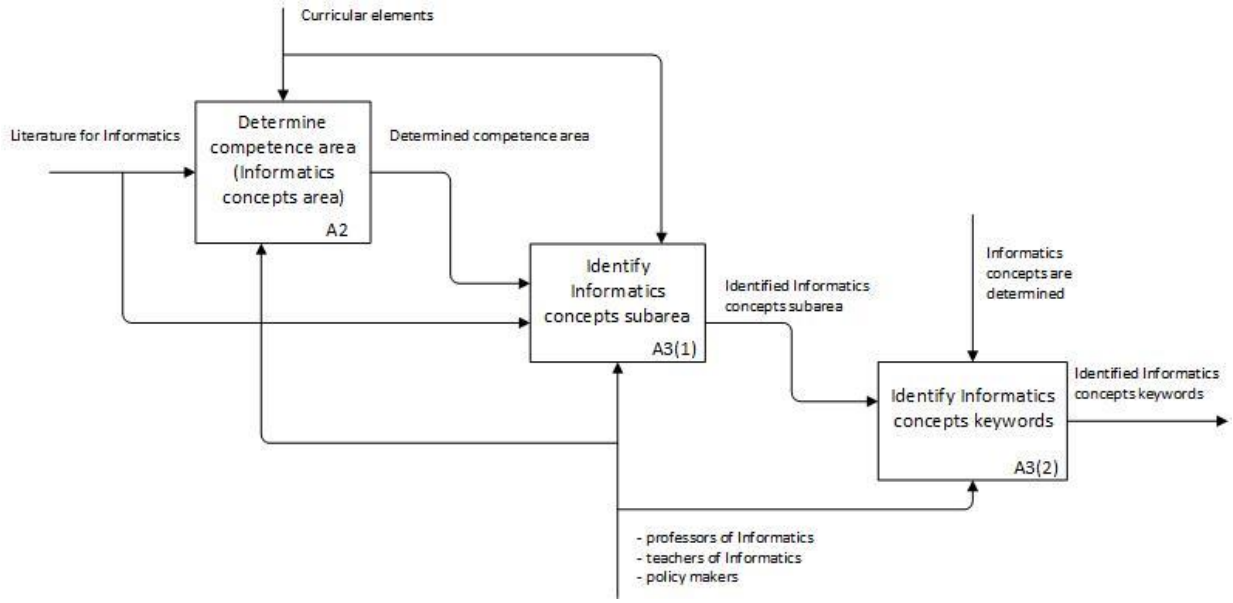

Figure 1 : Functional modelling method for informatics concepts identification

Results of applying IDEF0 method for identification of fundamental informatics concepts (Fig. 1) are presented in Annex. These concepts are hidden in short, interesting informatics learning tasks (e.g. tasks from the Bebras challenge).

Conceptualization is formation of concepts. 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.

New categorization system (Table 1) is suggested and dedicated to classify informatics learning tasks. The systems incorporate computational thinking skills categories and fundamental informatics concepts. It helps teachers of informatics to choose the content of lesson and effectively select the learning tasks according to the particular topic of theoretical informatics.

Table 1. Two-dimensional categorization system for informatics learning tasks

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

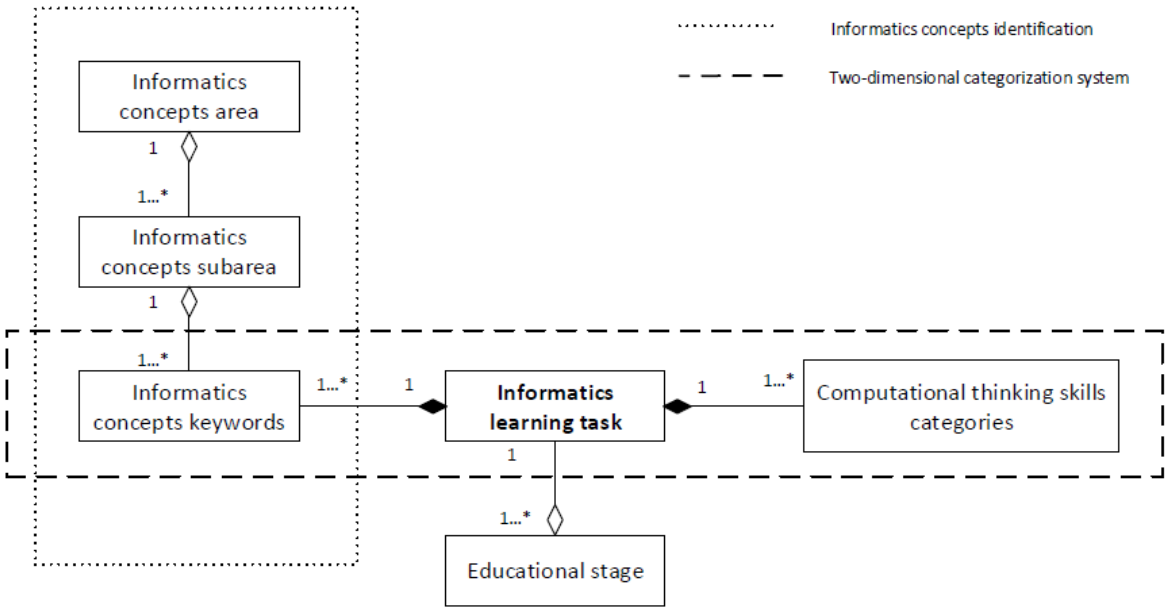

Figure 2 : Data model of model for concept-based informatics education at school

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Expectations and motivation to attend Doctoral Consortium

The new idea is to find relations between fundamental Informatics concepts and computational thinking skills. Which fundamental Informatics concepts affecting certain computational thinking skill?

Annex. Informatics concepts for K-12 education

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;
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	Cryptology	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;

RESEARCH OF TESTS GENERATION AND VALIDATION FOR INFORMATICS EDUCATION

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Your Brief Biography

My research is centered on the assessment of IT and informatics. The areas of scientific interest are assessment of student competencies, test validity and reliability, assessment tools. I'm involved in organizing the "Bebras" network on informatics and computational thinking.

The most recent publications:

1.Dagienė, V.; Stupurienė, G.; Vinikienė, L.; Žakauskas, R.. Introduction to Bebras challenge management: overview and analyses of developed systems // Informatics in Schools: Focus on Learning Programming : 10th International Conference on Informatics in Schools: Situation, Evolution, and Perspectives, ISSEP 2017, Helsinki, Finland, November 13-15, 2017: proceedings / eds. : V. Dagienė, A.Hellas. Series : Lecture Notes in Computer Science. Vol. 10696. ISSN 0302-9743. Cham : Springer International Publishing, 2017. ISBN 9783319714837. [12 p.].

2. Dagienė, V.; Stupurienė, G.; Vinikienė, L.. Informatics based tasks development in the Bebras contest management system // Information and software technologies : 23rd international conference, ICIST 2017, Druskininkai, October12-14, 2017 : proceedings / editors: R. Damaševičius, V.a Mikašytė . - Book series : Communications in Computer and Information Science. Vol 756. ISSN 1865-0929, eISSN 1865-0937. Cham : Springer, 2017. ISBN 9783319676418. eISBN 9783319676425. p. 466-477. DOI: 10.1007/978-3-319-67642-5_39.

3. Dagienė, V.; Stupurienė, G.; Vinikienė, L.. 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. DOI: 10.22364/bjmc.2017.5.3.05.

Research area description

In today's learning and teaching process, computational thinking (CT) plays the main role in informatics education. Systematic development of computational thinking (CT) includes incorporating thought processes that utilize abstraction, decomposition, algorithmic thinking, evaluation, and generalizations. Thinking computationally includes many different aspects, which could be taught already at comprehensive school level. Tasks of the Bebras challenge on informatics have been suggested as part of an instrument to assess those five skills of CT, but this instrument has not been empirically tested. In order to develop skills of CT, an instrument could be used to assess the skills of CT. Resnick et al. (2012) suggest three ways of assessing various aspects of CT in the context of Scratch projects: project analysis, artefact-based interviews, and design scenarios. Fairy assessment has been introduced to manually assess Alice projects (Werner et al., 2012). However, these suggestions are rather specifically oriented towards special software projects and thus do not apply very well to other situations.

The goal of my study is to identify the method measuring CT skills according examples of Bebras tasks (task used to assess informatics skills).

Testing system for the assessment of student knowledge has to fit the requirements of learning and teaching model or standard of tests. The main problem of this process is to identify correct assessment of the knowledge and skills, and describe item difficulty.

A calculation of the task difficulty value involves all participants' abilities to solve the task.

Methods used to measure test validity are complicated and require to measure dependency between cognitive inputs and cognitive attributes, goals of the testing (Lamb, R. et al. 2014). There exist classical test theory and item response theory.

In the classical test theory are not defined how different person or group will answer the specific questions. The statistic of the test depends on selected items, item difficulty, item discrimination (Assert, K. at al., 2014). Item Response Theory (IRT) works when there is a need to determine a student's level of knowledge. IRT is used analyse test score and the impact of the proportion how „easy" or hard" is the task (Forišek, M., 2009).

The main problem of test theory, which could be used to analyse Bebras tasks, is that most of the tasks are interactive or have interactive elements. We cannot predict how student will solve particular task. In addition, one task could measure not only one CT skill, but also two or more.

From literature review interactive elements of the task (graphic, animation, etc.) support student understanding of a content and how they construct meaning from the presented content. The following goals of the interactive tasks benefit could be mentioned: greater validity, increased student engagement and motivation, measurement of higher order thinking skills, promoted students' reflection by solving tasks, better evaluating the cognitive and problem-solving skills

The interactivity is very typical of computers, so it is clear that a computer-oriented challenge should apply interactive elements to explain or solve tasks. These interactive elements attract student's attention quicker and make the problem statement better understandable.

This first aim of the study is to understand if the tasks could be used to assess and differentiate five aspects of CT how it could be measured. Although tasks may in some cases develop more than one CT skill, we need to find the best method to measure that.

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Which methods could be used to analyse validity of educational informatics tests which are used to measure CT skills?