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Integrated E-Learning Objects Design Model and Implementation into Educational Platform

VILNIUS 2019

This dissertation was written between 2014 and 2018 at Vilnius University.

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Integruotų elektroninio mokymosi objektų kūrimo modelis ir diegimas edukacinėje platformoje

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1. INTRODUCTION

1.1 Scope and relevance

Application of the digital educational content and information communication technologies (ICT), new learning paradigms increase usage of mobile and smart technologies in the educational process. The changes of educational processes require new competencies and skills of teachers for learning objects design, development, reusability and provision or management of the technologies based educational process (Englund C. et.al. (2017), Tondeur et.al. (2017)). New technological solutions for learning objects design are also related with the functionality of the educational platforms, e-learning objects (ELO) interactivity and the repositories of open educational resources.

The educational platforms ensure successful implementation of the e-learning process but not always assure the effective design of the e-learning objects (ELO). The interaction between learning objects design environment and the repositories is needed. The design of integrated ELO is required for successful e-learning process implementation.

The scope of this work is to analyse the models related with the design and adaptation of e-learning objects in educational platforms by adapting and reusing the existing learning objects with similar content.

1.2 Relevance of the problem

The existing problem is that e-leaning objects design models and technologies usually do not assure effective integrated e-learning objects design process, namely:

1. Do not assure the processes of design, search and adaptation on a single educational platform,

2. Has no search targeted towards certain educational repositories of the open educational resources;
3. Do not ensure re-usability of the existing e-learning objects, as the current educational platforms do not guarantee the adaptation of the re-usable objects to a newly developed content.
4. Educators need a model that could assure integrated e-learning objects design on an educational platform based on mainly three processes: design, search and adaptation.

1.3   Research object

The object of the research is the processes of the integrated e-learning objects design and its integration into an educational platform.

The aim of the thesis to develop e-learning objects design model and a technology that enables the efficient design of new ELO and reusability (adaptation) of the existing ones.

1.4   The objectives of the research

For the aim of the thesis to be achieved by the following objectives have been set out:
1. To analyse the existing e-learning objects design models and to identify the ways of re-using and adaptation.
2. To develop integrated ELO design model.
3. To develop an educational platform prototype for integrated e-learning objects design model implementation.
4. To develop the methodology for integrated e-learning objects design model implementation.
5. To test the model in educational platform and to provide the results of testing.
6.

1.5 Research methodology

The theoretical model of the integrated ELO design and adaptation is based on learning practice and reusability of e-learning objects. The basis of the research methodology relies on analytical, generalization, constructivist and evaluation methods.

1.6 Scientific novelty

The novelty of the research is following:
1. Designed integrated e-learning objects design model assuring integral creating, search and adaptation processes.
2. The developed prototype of educational platform for integrated e-learning objects design based on three processes.

1.7 Practical novelty of the work

The integrated e-learning objects design model would help solve the identified problem. The integrated e-learning objects design model implemented into practice by the development of the:
1. Educational platform assuring the processes of ELO design, search and adaptation.
2. E-learning objects repository.

The model for the integrated e-learning objects design is beneficial for ELO developers in the design and improvement of distance learning courses, massive open online courses, and other. ICT-based content.

The model enables design and adaptation of e-learning objects, their integration into different educational platforms, assure teacher's minimal time to create or adapt an e-learning object and integrate it into the educational platform.

The aim of this model is to assure the integrated ELO design process and adaptation of reusable objects by searching them on the selected repositories and assigning to the newly developed ELO.

1.8 Defending propositions

Defending propositions of the thesis are:
1. Developed integrated e-learning objects design model assure integral processes of design search and adaptation.
2. Developed prototype of an educational platform assure the design of integrated ELO by using existing re-usable e-learning objects.

1.9 Approbation of the research

The main results of the dissertation have been presented in 6 research papers which have been published in periodicals and peer-reviewed scientific journals. The main results have been presented and discussed at 2 national and 4 international conferences.

1.10 Outline of the dissertation

The paper consists of four main parts – chapters, conclusions and results, references and annexes. The volume of the paper is 150 pages. There are 59 figures, 20 tables, 6 annexes and 105 references in the thesis.

The first chapter discusses the relevance of research, states research objectives and aim, also scientific novelty, practical novelty of the work, defended propositions and approbations.

In the second chapter, e-learning objects as well as theoretical assumptions on the design and description of learning objects are discussed. Educational platforms are analysed by their significance and their impact on the educational process is described.

In the third chapter, a developed model for the design of integrated e-learning objects is described. The model enables the design of new ELO and adaptation of the already existing ELOs. The architecture for the educational platform to implement the developed model is presented.

In the fourth chapter, evaluation and validation of the developed model are provided, the experiment is described, the defending propositions are approved and conclusions given. During an expert evaluation, the experts had an opportunity to analyse projection, design and provision processes of ELO, i.e. they evaluate suitability of the learning objects for learners within a certain context.

The thesis ends with the conclusions and results.

2. THE OVERVIEW ON MODELS FOR THE DESIGN OF THE E-LEARNING OBJECTS

Learning objects have been applied in an educational practice for a long time. However, high quality and effective reusability or adaptation by supplementing with others, remains the problem.

The research focus on the analysis of the importance of technologies in educational practice, possibilities to design and adapt e-learning objects, perform search for the learning objects in the external repositories, automated integration into developing ELO and the conception of learning objects, which is applicable to e-learning sphere for making learning content availability, reusability and interaction easier.

E-learning objects based on one or several technologies can be improved or adapted by adding a new ELO. However, the process should start earlier, a model for the design of the integrated ELOs has to be developed and educational platform prepared for the model integration and implementation.

Many models, for example, the Verbert and Duval model (Verbert, Duval, 2008); the Meyer model (Arreola, 1998); the Boyle model (Cheng, Yen, Chen, Yang, 2010); the Santiago and Raabe integrated model (Burbaite, 2014); „Learnactivity" content model (Verbet, Duval, 2008); NETg MO model (Allen, Mugisa, 2010); BNTOPM model (Gutierrez et al., 2016); „Navy" content model (Verbet, Duval, 2008); ALOCOM model (Psyllidis, 2015); Dynamic content management system's model (DMTVS) (McGreal, 2004), CISCO (http://www.cisco.com/) have been analysed.

A conducted literature analysis shows that teachers constantly need to adapt or improve educational content and this could be done effectively on one educational platform assuring three processes ELO design, search and adaptation, but no existing model or educational platform assures three processes for integrated learning objects design.

3. DEVELOPMENT OF THE MODEL FOR THE INTEGRATED ELO DESIGN

The existing models do not assure effective processes of the design of integrated e-learning objects, however, none of these effectively assures the ELO design and search in open repositories or suggests similar content objects for integrating into a newly designed ELO.

The research describes the model for the design of integrated ELOs based on the learning objects lifecycle and the specifics of ELOs. It enables the ELOs to be efficiently developed and adapted (see Fig. 1).
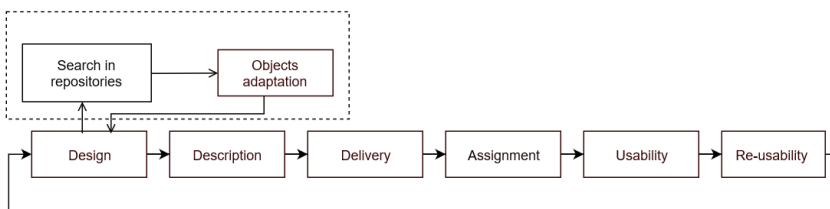

Fig. 1. Life cycle fulfilled with search in the repositories and object adaptation.

For the framework of the developed model, there are the main conceptual elements to be taken into account: (1) the classification of e-learning objects, (2) the ELO life cycle, (3) the search in the repositories, (4) the functionality of the ELO repositories, and (5) the possibilities to adapt ELO in educational platform.

3.1 Technological concept of the model

The use of technologies in an educational platform has a direct impact on the process of delivery. However, the technology must understand the needs of the user considering the metadata of the ELO, i.e. by describing the learning object, identifying the information of an

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existing ELO - general information, lifecycle, metadata, technical, educational, rights, communication, annotation and classification.

The framework for the integrated ELO design is based on three user's roles: teacher, designer and student (Fig. 2).
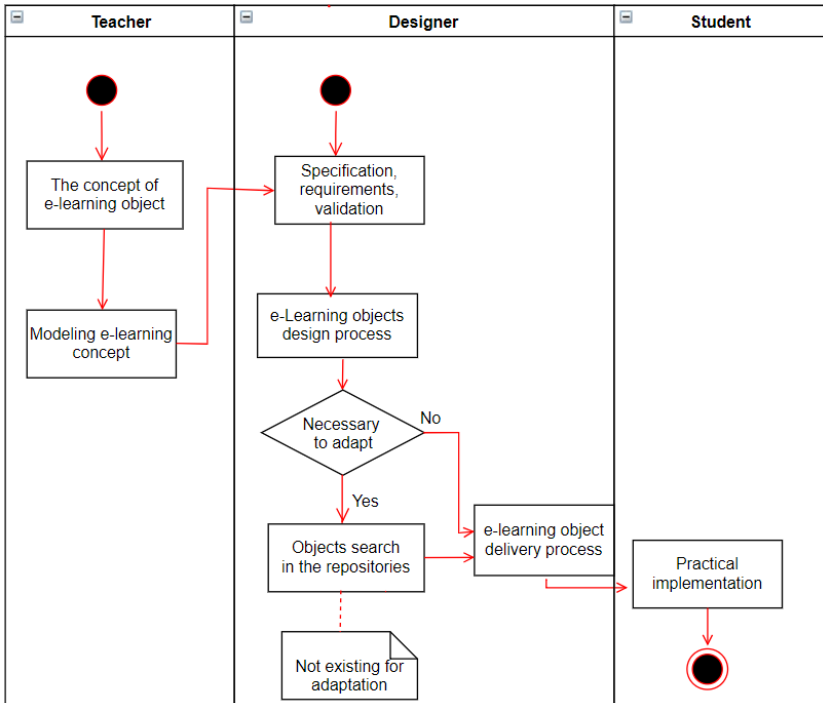

Fig. 2. Framework for the e-learning objects design.

Under the needs related with linking learning objects of the similar content search in the repositories, where components (ELO metadata, ELO repositories with the search function, establishment of the functionality to identify the relations with other re-usable ELO) are used to establish the relations, is required. It was intended to include search in the repositories when designing the model for the e-learning objects, which would allow to complete the design process of

the object, to establish relationships with similar objects and add them to the object being adapted as under metadata, users can discover useful learning material.

The developed model includes the following essential three processes, i.e. design, and search in the repositories and adaptation. Different learning objects could be planned and developed using open source tools and tools for organizing different learning activities. Technological requirements of the model are directly related to the functionality of the model:

1. to meet the requirements for reusability,
2. to describe the structure and functionality of the original e-learning object (OMO) so that it is suitable for any other ELO,
3. to satisfy the conditions of integrity (content and pedagogical requirements) and compilation,
4. to be based on the concept of variability, the concept of representation, presentation and process management of ELO,
5. to describe the structure of the ELO in such a way that it does not make it difficult to realize the main attributes of the model paradigm,
6. the model implementation process should be simple and must be repeated, by other users,
7. technologically the model supports the following processes control options: reading, displaying, recording, modifying, commenting, feedback, reusing, communicating,
8. the model ensures the technical implementation of the listed tasks,
9. the integration and implementation of the model must be supported by educational platform and repository,
10. the model could be tested by analysing at least a few options.

The educational platform has been designed for the model integration and implementation.

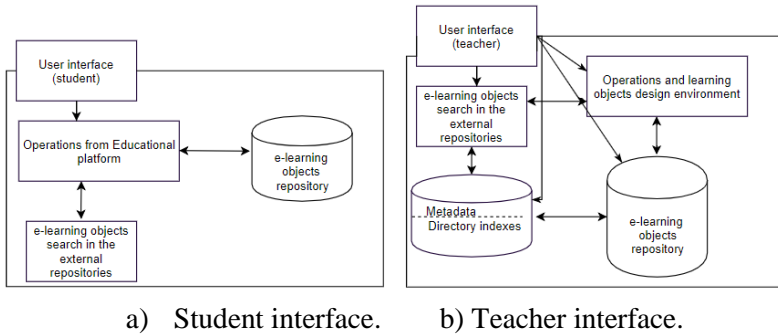a)   Student interface.   b) Teacher interface.
Fig. 3. Architecture of the ELO repository.

The content management system DUPAL used to design educational platform and ELO submission service based on a link that is compatible with the OAIS-PMH protocol. The protocol allows search in the selected educational, open-source resources data basis.

3.2. The conception of the model

The model for the design of the integrated ELOs applies the developed technologies to facilitate the retrieval, reuse and adaptation of the ELOs located in the repositories. The essence of the search in the repositories is to find ELO - like content not only in national, but also in international repositories or direct referrals to certain topics. The search process in educational platform is presented in Fig. 4.
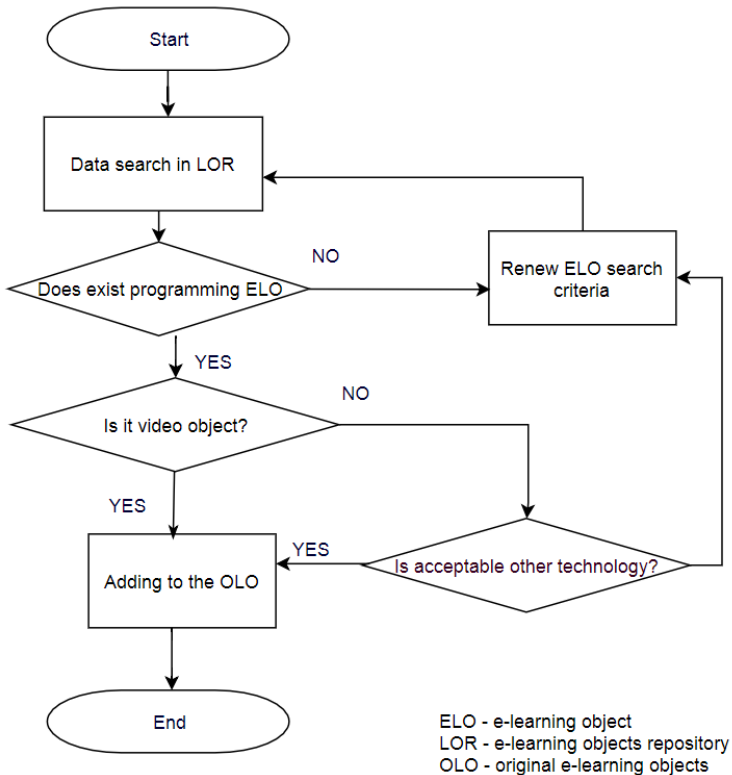
Fig. 4. ELO search process in the repositories.

The search in the repositories with the design of the integrated ELOs in the educational platform. Each ELO required to be describing and assigning to a specific repository area that holds objects of various technologies and content. Another important task is to develop links between the storage and the users (a student and a teacher) (Fig. 5).
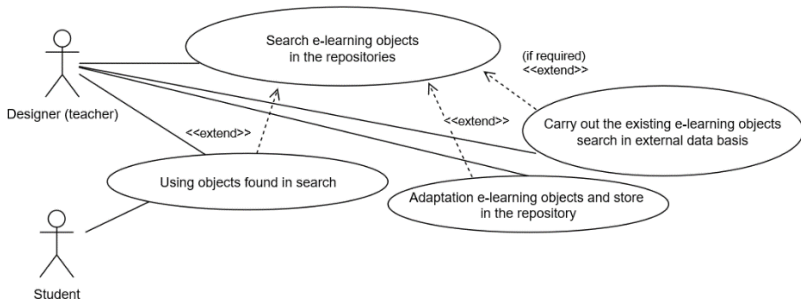
Fig. 5. Scheme of the repository and users' relations.

It is important to ensure the processes (design, search, adaptation) where the use of the repository may be also the <<include>> case aggregation and the aggregation relationships. <<include>> connection means that the use case consists of certain necessary instances of re-usability.
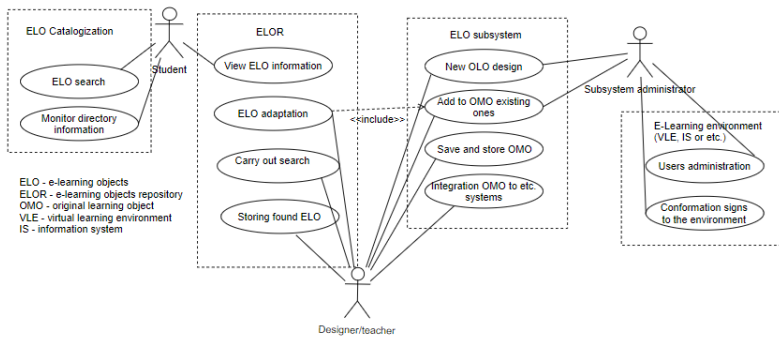

Fig. 6. User case diagram of the model for the design of the integrated ELO.

The model has been implemented in the educational platform to reach the users in the user-friendly environment.

3.3. Learning object's design, search and adaptation processes

OLO is an original learning object that could be designed or found in the repositories and integrated into the learning environment by using different technologies. A newly designed object can be (1) one technology-based learning objects, i.e. one video, audio, graphic, or (2) the integrated object, i.e. a lesson, course or the whole learning program. The design process is directly linked with the learning goal identification, objectives, and design process, description of metadata, repository hosting, quality evaluation and publication in the repository. All the features are directly related with the ways of OLO adaptation:

1. Use the OLO structure as it is.
2. Use the OLO structure by adding it to new data fields in order to provide possible individual requirements.
3. OLO to localize as far as possible or completed without adding additional information fields in the structure.
4. OLO localization by adding additional information fields in the structure.
5. OLO finds and compares everything or a certain part of it.
6. Add to the OLO pedagogical and learner's attributes as a context and associate it with the learning object.

Initially OLO design should be supported by filling metadata. The metadata describes the variation of the adapted learning object (ALO), and when adapting the OLO becomes important to consider the stages of the lifecycle of the object, and the 9 LOM categories (general, lifecycle, metadata, technical, educational, rights, relations, annotation and classification).

However, the main three processes of ELO (design, search and adaptation) are performed in the newly implemented model for the design of the integrated ELOs.

During the first process, an original e-learning object is designed, the objectives of the learning object and metadata are

described. The object is stored in the repository of the educational platform, evaluated for its quality and is provided for publication or integration into other virtual environments or systems supporting the learning process.

During the second process, the original e-learning object can be supplemented by other learning objects by performing automated searches in repositories and by assigning appropriate content to the object being developed, as well as by checking that the found object meets the required content, if so, added to the object being developed or adapted if not updated.
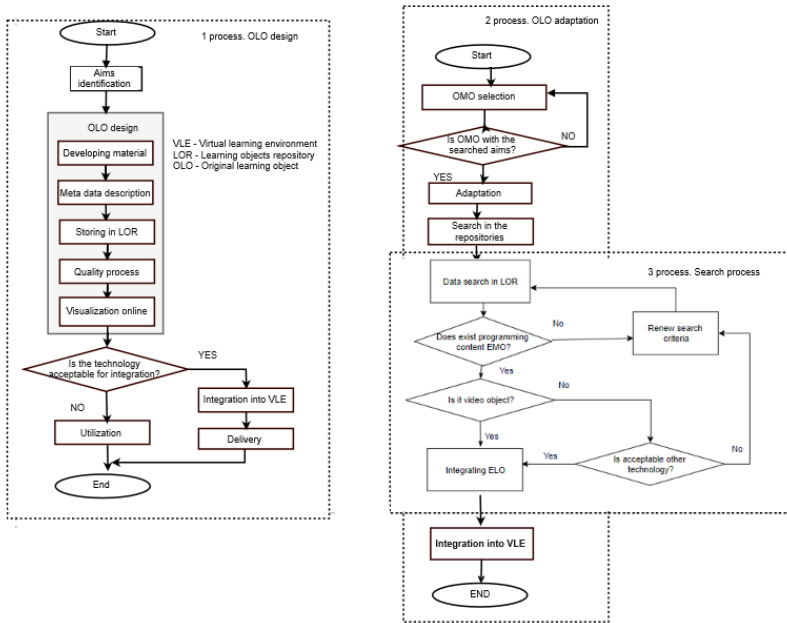

Fig. 7. The integrated e-learning objects design model based on three processes.

The third process involves the adaptation of the original e-learning object also by making it integrated. We will be able to adapt the ELO to complement the search for other technology objects in

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open national and international educational repositories. The processes for design, search and adaptation will ensure the efficient creation and adaptation of the ELOs. Finally, the integrated and adopted ELOs might be the result of the third process of the model and could be stored in the educational platform.

The educational platform is developed for the model implementation into practice. The requirements analysis and specification planned for the educational platform to implement the model of the integrated ELO design (Fig. 8).
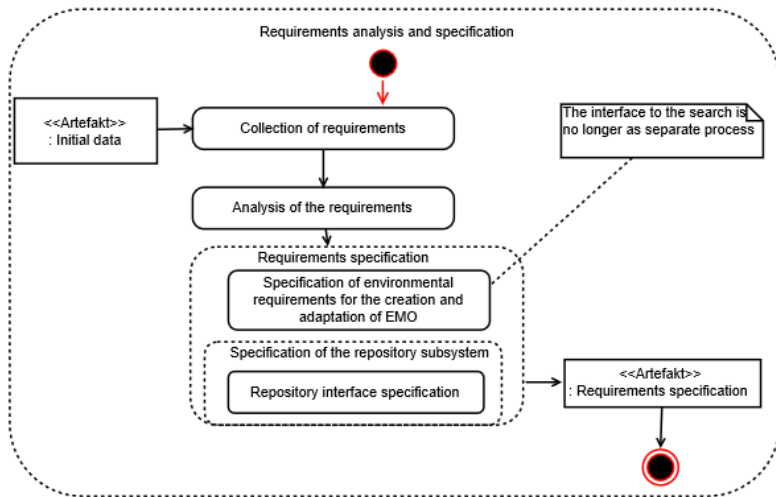

Fig. 8. Technological specification of the educational platform.

In the second phase the educational platform is designed and adaptation environment integrating database and subsystem of the repository (Fig. 9).
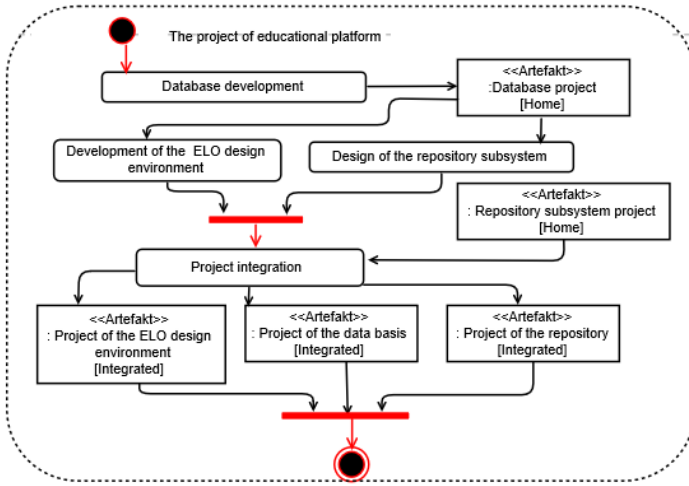
Fig. 9. The design of educational platform.

The model for the design of the integrated ELOs supported by learning object lifecycles and the specificity of ELO, which allows the ELO to be efficiently developed and adapted (Fig. 10).
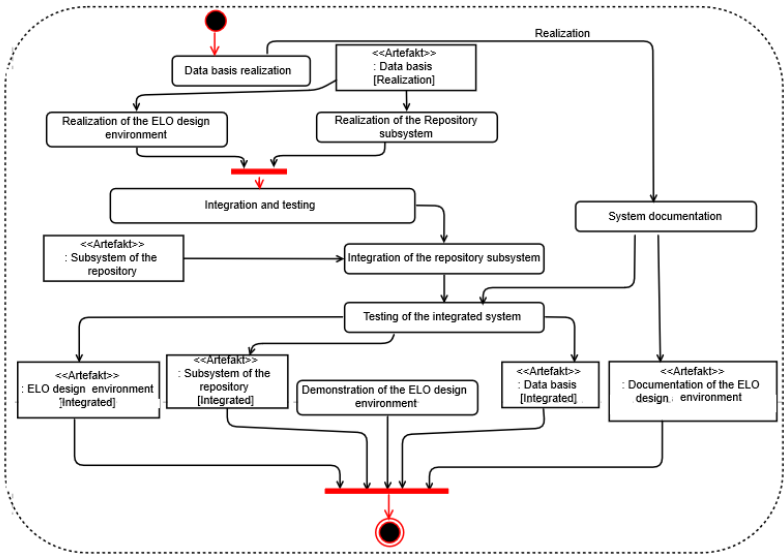

Fig. 10. The realization of the educational platform.

The fourth stage of the educational platform design is related with implementation into practice (Fig. 11).

Fig. 11. Framework for implementation processes.
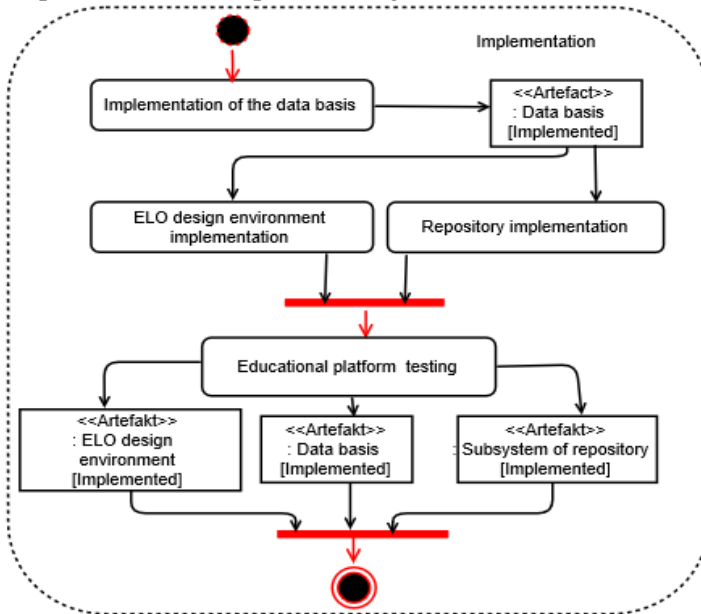
The model for the search of the integrated ELOs enables ELO search in repositories and the integration into an educational platform, regardless of their origin and type by saving time for design to a minimum, integrates the ELO into a variety of learning environments and different repositories. To evaluate the effectiveness of the model, expert evaluation has been conducted.

4 THE EXPERT EVALUATION OF THE DEVELOPED MODEL

The aim of this evaluation process is to validate the developed model and prove effectiveness of the integrated ELO design model based on technological solutions.

The requirements for experts: ELO design experience (at least 5 years); ELO delivery experience; scientific articles related to the ELO topic; made presentations about ELO in international conferences (at least two); ELO assessment experience (at least 5 years), experience of working on educational platforms.

The expert group consisted of ten experts working in different areas of the e-learning, information technology, computer engineering, teaching technology and systems engineering. The questionnaire was developed according to Likert scale. The second part of the questionnaire contained open questions (totally 8).

The model for the ELO design and evaluation process has been developed, 10 experts who have already worked with various learning systems, repositories and having expertise in developing various types of e- learning objects and customizing the existing ones invited. An expert evaluation paid drawing attention to the application of technologies in the context of a new model and the search for existing objects in the repositories with the aim to adapt and re-use.

An expert report summarises the opinion of an expert group. Special expert skills in a particular field were required, experts can be a source of qualitative information, and the quality of the experts might be assessed as a general indicator.

The main criteria for the evaluation of the model for the design of the integrated e-learning objects identified are (1) effectiveness and (2) functionality.

Data of the questionnaire on the identification and the comparing of the existing learning environments existing in Lithuania and the new educational platform have been collected (Table 1).

Table 1. Comparison of the existing learning environments under selected standards.

Criteria	Moodle (mostly used in Lithuania)	Model - based educational platform (newly developed)
ELO type (IEEE 1484.12.1-2002)	Tasks, simulations, quarries, diagrams, graphics, slides, txt documents, experiment, lecture, video object, infographics.	Tasks, simulations, quarries, diagrams, graphics, slides, txt documents, experiment, lecture, video object, infographics.
Interactivity type (ELO) (IEEE 1484.12.1-2002)	Low	Very high
Types of users (IEEE 1484.12.1-2002)	Teacher, designer, learner, administrator	Teacher, designer, learner, administrator
Complexity (designer role) (IEEE 1484.12.1-2002)	Complicated	Not complicated
Openness level	Closed. There is possible adaptation just by the author who developed ELO.	Fully open, mobile, design and adaptation is organized in the educational platform, search is organized in the external educational platforms, possible adaptation and re-usability of ELO.

The integrated e-learning object design model is integrated into the developed educational platform (oer.ndma.lt), where practical implementation is assured.

The model is useful for designers, developing and improving distance education courses, massive open online courses and other ICT – based learning content. During the experiment, the experts analysed two methods: M1 – intuitive and M2 – systematic based on the developed model (Table 2).

Table 2. The comparison of the M1 and M2 methods.

Evaluation criteria	M1 - intuitive	M2 - systematic
Design	Intuitive	Systematic
ELO Type	One technology	Integrated
Model implementation	Usual	Automatic
Re-usability	1 or two versions	many: depends on parameters
Realization level	Simple	High-level demanding advanced analysis and programming
Adaptation	Manual support	Automatic
Technological solutions	Standard for working with the text	Standard for the text and standard programing
Usability (users interface)	Easy	Very easy

The main aspects rely on the material design, reflection, and re-usable objects integration into one ELO. The table (2) shows that the new model is systematic, integrated, automatic, having many re-usability ways, with high level demanding advanced analysis and programming, adaptation and easy to use. The design process is established on the educational platform, which is compared with other analysed environments (see Table 3).

Table 3. Comparison of the educational platforms based on 3 processes.

Processes	Analysed educational platforms	Model based educational platform
1 process Design	The design process is not related with the further original learning object (OLO) reusability. OLO is not mobile, not applicable transformation into other platforms, OLO just for registered users.	The design process is directly related to the search and adaptation processes, the Object is mobile, open, and accessible to external users, easily integrated into the other Educational platform.
2 process Search	Search possible only in the category of courses, no individual learning objects are searched, closed objects are not accessible to unregistered users.	You can search for various OMO technologies, there is possible search in internal and external repositories, and search can be directed to several targeted repositories, specialized content, searchable for all users. The found OMO directory can be integrated at the time of creation into a newly designed OMO.
3 process Adaptation	Adaptation can be done only after creating a backup (Backup), only by the user who creates the OMO.	Adaptation is possible on any object created on the educational platform. Adapted OLO can also be an open source for external storage.

The multiple questions were constructed for experts to identify expert's opinion about the three e-learning objects design process (Fig. 12). According to the two criteria, experts evaluated the newly developed model: model effectiveness (fig. 12) and model functionality (fig. 13).
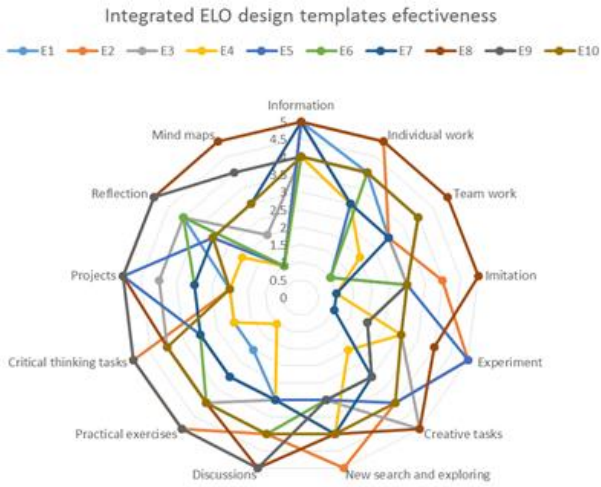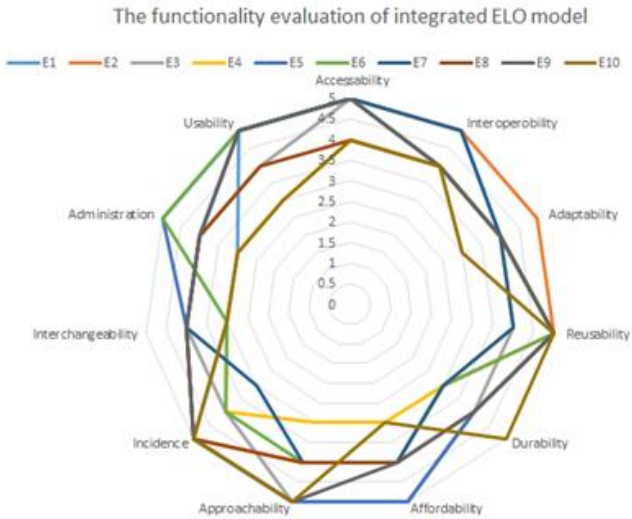
Fig. 12. Evaluation of the model effectiveness.

Fig. 13. Model functionality evaluation.

The availability of the technology is quite simple and intuitive. Reading and retrieving information is useful, however, interactive tasks help to highlight what matters the most. Such EMO can be useful in developing interactive learning content. Experts evaluated that the technological accessibility is very simple and intuitive, and this gives a possibility to users with low IT skills to design interactive e-learning objects on the educational platform.

The adaptation process (Fig. 14) also helps users with low skills to design interactive e-learning objects by searching in the repository for existing reusable ELO and integrating it into a newly designed or redesigned ELO.
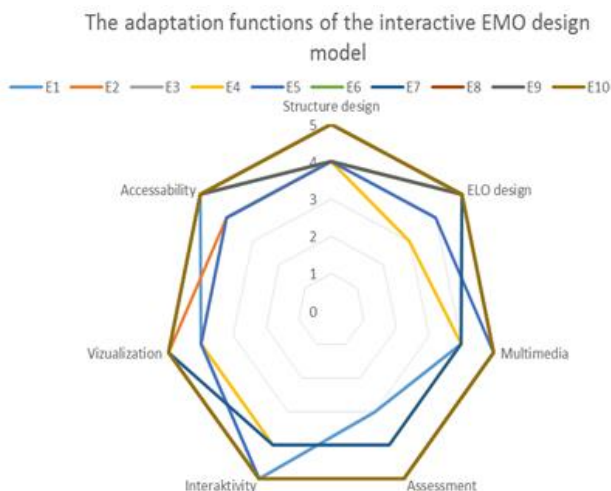

Fig. 14. Evaluation of the ELO adaptation functions.

The experts provided an opinion that the integrated ELO is much faster to design using educational platform with the integrated newly developed model (fig. 15).

Please identify which object design process is faster?

Any learning object, i.e. voice, text, video, etc.   3

Integrated learning object with the catalog of open educational resources (by using search in the repositories)   7
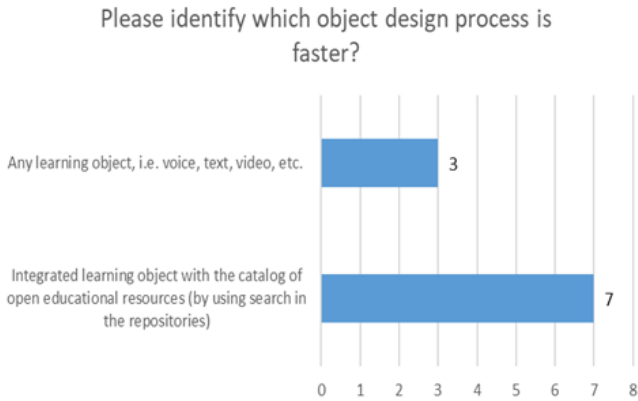
0 1 2 3 4 5 6 7 8

Fig. 15. Design process evaluation.

Evaluation is carried out on the ELO design process (fig. 15) and learning process (fig. 16) based on the existing models and the new model.

How do you think, which learning object is more effective to learners to get faster new skills?

Any learning object, i.e. voice, text, video, etc.   1

Integrated learning object with the catalog of open educational resources (by using search in the repositorries)   9
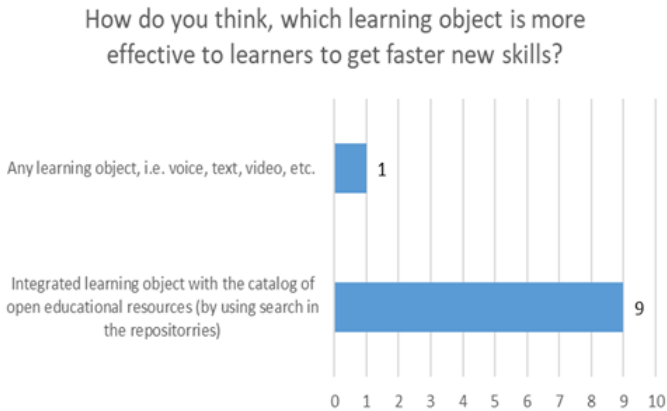
0 1 2 3 4 5 6 7 8 9 10

Fig. 16. Learning process effectiveness.

The experts were asked to answer about the usefulness of the search in repositories automatically generated in the system by

choosing a new ELO in the open educational resources repositories. Only one expert declared that he was not sure if it was useful (Fig. 17).
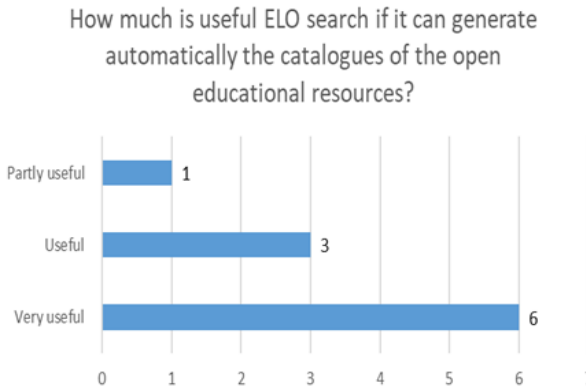
How much is useful ELO search if it can generate automatically the catalogues of the open educational resources?

Partly useful	1
Useful	3
Very useful	6

Fig. 17. Evaluation of the search process.

The effectiveness of the ELO design depends on automatization processes.

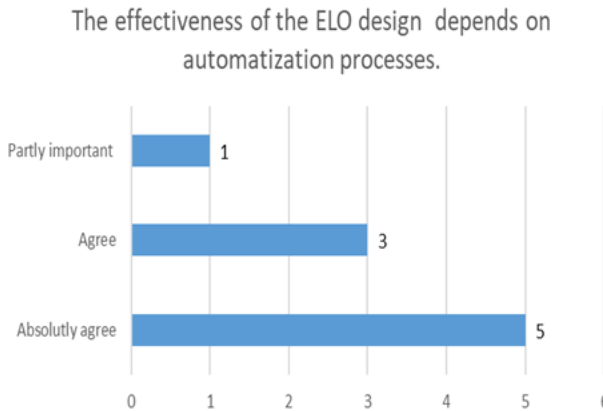|	
Partly important	1
Agree	3
Absolutly agree	5

Fig. 18. Evaluation of the adaptation process.

The evaluation process was also organized on the educational platform. The results of the control and experimental groups were measured. For the experiment, conclusions based on the control group Ķ1 results (R1 – R19) and experimental group E1 results (R1 – R25) (fig. 19) were drawn.

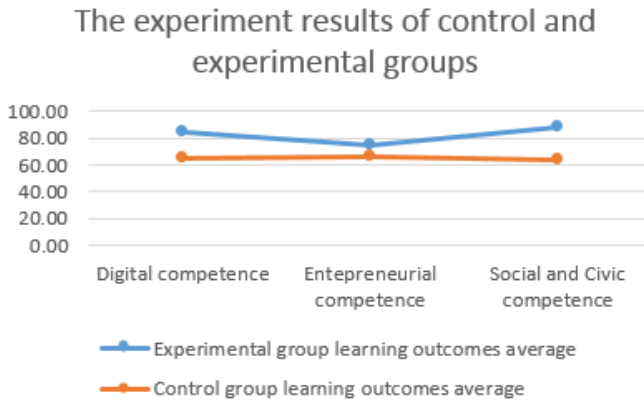The experiment results of control and experimental groups

Fig. 19. The experiment results of control and experimental groups.

Evaluation results show learning outcomes in average of 15,2 % are better of the experimental group than of the control group when the experimental group took part in trainings on the educational platform on the basis of the newly developed model for the design of e-learning objects.

GENERAL CONCLUSIONS AND RESULTS

1. The literature analysis of existing learning object design models has shown the lack of ELO design models assuring three processes design, search and adaptation processes in one educational platform.

2. A model for the integrated ELO design based on the ELO lifecycle has been developed and assures integral processes of design, search and adaptation.

3. The developed architecture of the educational platform and the prototype ensure the three core ELO processes, i.e. design, search and adaptation in one educational platform.

4. The model's evaluation process has shown that integrated e-learning objects design model is a high level of interactivity (according to IEEE 1484.12.1-2002), a simple process of object design, and high degree of openness (consistent with the concept of open educational resources). ELO designed by using the model could be used in other educational platforms.

5. The experiment has shown that learning outcomes of the experimental group (who studied on the educational platform using the new model) are on average 15.2% better than that of the control group.

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1. Gudoniene, Daina; Dagiene, Valentina; Bartkute, Reda. The Integrated Environment for Learning Objects Design and Storing in Semantic Web // International Journal Of Computers Communications & Control. Bihor: CCC Publications. ISSN 1841-9836. 2018, vol. 13, iss. 1, p. 39-49. [Science Citation Index Expanded (Web of Science); Scopus]. [IF: 1,374; AIF: 2,682; IF/AIF: 0,512; Q3; 2017 Journal Citation Reports® Science Edition (Thomson Reuters, 2018)].

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ABOUT THE AUTHOR

Daina Gudoniene graduated at Kaunas University of Technology in 2005 – bachelor studies, in 2007 – master studies, in 2018 doctoral studies (in the Technological sciences, Informatics Engineering field) at Vilnius University. In 1999 started to work at Distance Learning Centre at Kaunas University of Technology. Since 2010 working in the Informatics faculty at Kaunas University of Technology as a lecturer in distance study program. In 2017, got one – year scholarship for academic achievements from Research Council of Lithuania.

SANTRAUKA LIETUVIŲ KALBA

Mokymų kokybė ugdymo institucijose užtikrinama ne tik turima įranga, interneto ryšiu, bet ir kokybiškomis, edukacinius poreikius atitinkančiomis paslaugomis. Skaitmeninis edukacinis turinys ir informacinių komunikacinių technologijų (IKT) taikymas, mokymosi technologijų ir technologinių sprendimų kaita, didėjantis mobiliųjų ir išmaniųjų technologijų naudojimas mokymo ir mokymosi procese, anot C. Englundo ir kt. (2017), J. Tondeuro ir kt. (2017), keičia mokymosi procesą, iš pedagoginio personalo reikalaujama naujų kompetencijų ir įgūdžių projektuoti, kurti, teikti ar valdyti technologijomis grįstą mokymosi procesą.

Tokiam mokymosi procesui reikalingi mokinio poreikiais paremti technologiniai sprendimai, apimantys edukacinę platformą, mokymosi objektus, atvirųjų švietimo išteklių saugyklas, objektų adaptavimo ir teikimo technologijas. Edukacinėmis platformomis kuriamas sėkmingas mokymosi procesas, bet ne visad užtikrinamas efektyvus integruotų mokymosi objektų kūrimas ar adaptavimas.

M. Raspopovicius ir kt. (2016) teigia, kad edukaciniame kontekste IKT paskirtis ir technologijų taikymas el. mokymosi objektams kurti yra suvokiamas plačiau: bendrasis mokymasis, mokymasis bendradarbiaujant, refleksija ir pan., o mokymosi objektai gali būti kaupiami įvairiose atvirųjų švietimo išteklių saugyklose ar edukacinėse platformose.

Edukacinėje platformoje galima kurti įvairius elektroninius mokymosi objektus. M. Raspopovicius ir kt. (2016), S. Yassine ir kt. (2016), J. Zhao ir kt. (2016) teigia, kad nėra kitų tokių sistemų, kurios kurtų, kauptų MO ir leistų juos adaptuoti bei integruoti į naujus kuriamus el. mokymosi objektus.

El. mokymosi objektų paieškos metodus saugyklose analizuoja autoriai J. Puustjarvi ir L. Puustjarvi (2014), D. Martin-Moncunillas ir kt. (2016), J. M. Arteaga (2010), kurie teigia jog paieškos procesas vykdomas tik tam tikroje saugykloje ir nėra

siejamas su objektų kūrimo aplinka. F. A. Dorça ir kt. (2017), Z. Carvalho ir kt. (2017) analizavo elektroninių mokymosi objektų turinio adaptavimą individualiam mokymuisi pedagoginiu aspektu, tačiau nesiejo EMO adaptavimo su edukacine platforma.

Išanalizavus daugelį literatūros šaltinių, nerasta informacijos apie elektroninio mokymosi objektų adaptavimą, kai prie kuriamo objekto priskiriami ir pakartotinai naudojami panašaus turinio egzistuojantys objektai, tad tyrime orientuotasi į tokių integruotų el. mokymosi objektų kūrimo, paieškos ir adaptavimo procesus edukacinėje platformoje.

1.1 Tyrimo problema

Darbo problema: esami integruotų el. mokymosi objektų (EMO) kūrimo modeliai ir technologijos neužtikrina efektyvaus integruotų EMO kūrimo proceso, nes:

1. neužtikrina kūrimo, paieškos ir adaptavimo procesų vienoje edukacinėje platformoje,
2. neturi paieškos, tikslingai nukreiptos į tam tikras edukacines atvirųjų švietimo išteklių saugyklas,
3. neužtikrina daugkartinio EMO naudojimo, nes egzistuojančios edukacinės platformos neleidžia adaptuoti jau sukurtų mokymosi objektų ir jų priskirti prie kitose nurodytose saugyklose surastų EMO.

Dėstytojams reikia modelio, kuris užtikrintų efektyvų integruotų el. mokymosi objektų kūrimą ir adaptavimą.

1.2 Tyrimo objektas

Šio tyrimo objektas – integruotų el. mokymosi objektų kūrimo procesai ir integravimas į edukacinę platformą.

1.3 Tyrimo tikslas

Suprojektuoti integruotų el. mokymosi objektų kūrimo modelį ir pagal jį sukurti technologiją, kuri leistų efektyviai kurti naujus EMO ir pakartotinai naudoti (adaptuoti) esamus.

1.4 Darbo uždaviniai

Darbo tikslui pasiekti atliekami šie uždaviniai:
1. išanalizuoti esamus mokymosi objektų kūrimo modelius, norint išsiaiškinti EMO pakartotino naudojimo ir adaptavimo ypatybes,
2. suprojektuoti integruotų EMO kūrimo modelį,
3. sukurti edukacinės platformos prototipą ir įdiegti į jį integruotų el. mokymosi objektų kūrimo modelį,
4. parengti integruotų EMO kūrimo procesų aprašą sukurtam modeliui,
5. ištestuoti integruotų EMO kūrimo modelį edukacinėje platformoje ir pateikti vertinimo rezultatus.

Iki šiol informacija apie objektų kūrimo modelius ir taikymą edukacinėje praktikoje nebuvo susisteminta. Numatyta išanalizuoti modelių trūkumus ir pateikti problemų sprendimo būdus, taip pat sukurti modelį, kuris ne tik turėtų EMO kūrimo aplinką su funkcijomis kurti įvairaus formato ir įvairiomis technologinėmis galimybėmis grįstus mokymosi objektus, bet ir papildytų juos panašaus turinio mokymosi medžiaga, rasta per paiešką atvirosiose švietimo išteklių saugyklose.

1.5 Tyrimo metodai

Tyrimo metodologija grįsta literatūros šaltinių analize, rezultatų projektavimu bei eksperimentine dalimi, ekspertiniu vertinimu.

1.6 Mokslinis naujumas

Darbo mokslinis naujumas:

1. suprojektuotas integruotų EMO kūrimo modelis, užtikrinantis integralius kūrimo, paieškos ir adaptavimo procesus,
2. sukurtas edukacinės platformos prototipas integruotiems el. mokymosi objektams kurti, grįstas trimis procesais.

1.7 Praktinis naujumas

Integruotų el. mokymosi objektų kūrimo modelio eksperimentinis aprobavimas rodo, kad modelis yra taikytinas praktikoje.

Integruotų mokymosi objektų kūrimo modelis padėtų išspręsti disertacijoje keliamą problemą. Integruotų el. mokymosi objektų kūrimo modelis įgyvendinamas sukuriant:

1. edukacinę platformą,
2. el. mokymosi objektų saugyklą.

Integruotų mokymosi objektų kūrimo modelis naudingas EMO kūrėjams, kuriantiems ir tobulinantiems nuotolinius mokymosi kursus, masinius atviruosius internetinius kursus ir kt. IKT grįstą turinį.

Modelis leidžia integruotų el. mokymosi objektų kūrimą ir adaptavimą, integravimą į skirtingas edukacines platformas nepaisant kilmės ir tipo, t. y. leidžia dėstytojui ar mokytojui minimaliomis laiko sąnaudomis sukurti ir integruoti el. mokymosi objektą į edukacinę platformą.

Šio modelio tikslas – efektyvinti el. mokymosi objektų kūrimo procesą, užtikrinti panašaus turinio el. mokymosi objektų paiešką saugyklose ir priskyrimą prie kuriamo el. mokymosi objekto.

Parengtas modelis ir praktinis taikymas naudingas kursų projektuotojams, t. y. dėstytojams ir mokytojams, kurie kuria, tobulina kursus ar taiko technologijomis grįstą mokymąsi praktikoje.

1.8 Ginamieji teiginiai

Disertacijoje keliami šie ginamieji teiginiai:
1. suprojektuotas integruotų EMO modelis užtikrina integralius kūrimo, paieškos ir adaptavimo procesus,
2. sukurtas edukacinės platformos prototipas užtikrina integruotų EMO kūrimą, panaudojant egzistuojančius el. mokymosi objektus.

1.9 Darbo publikavimas ir aprobavimas

Disertacijos rezultatai pristatyti 6-se mokslinėse konferencijose bei pateikti 6 mokslinėse publikacijose.

BENDROSIOS IŠVADOS

1. Atlikta esamų mokymosi objektų kūrimo modelių analizė parodė, kad juose trūksta mokymosi objektų projektuotojams būtinų EMO kūrimo, adaptavimo ir paieškos procesų vienoje edukacinėje platformoje.

2. Suprojektuotas IEMOK modelis, grįstas EMO gyvavimo ciklu, pritaikytas edukacinei platformai ir sudaro sąlygas kurti EMO, ieškoti išorinėse saugyklose ir adaptuoti EMO toje pačioje edukacinėje platformoje.

3. Sudaryta edukacinės platformos architektūra ir parengtas prototipas užtikrina joje 3 pagrindinius EMO procesus: kūrimo, paieškos ir adaptavimo.

4. IEMOK modelio testavimo procesas parodė, kad lyginant su analizuotais modeliais, taikant IEMOK modelį sukurti EMO yra aukšto interaktyvumo lygmens (pagal IEEE 1484.12.1-2002 standartą), nesudėtingo objektų kūrimo proceso, aukšto atvirumo lygmens (atitinka atvirų švietimo išteklių koncepciją), mobilus, t.y. galima kelti ir į kitas edukacines platformas.

5. Atliktas eksperimentas parodė, kad eksperimentinės grupės studentų (kurie mokėsi edukacinėje platformoje, taikydami IEMOK modelį) mokymosi rezultatų vertinimas pagerėjo vidutiniškai 15 % .

PUBLIKACIJŲ SĄRAŠAS

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TRUMPOS ŽINIOS APIE DISERTANTĘ

Daina Gudonienė baigė magistro studijas 2007 metais Kauno technologijos universitete. 1999-2010 metais dirbo KTU Distancinio mokymo centre, nuo 2010 metų iki šiol dėsto KTU nuotolinių studijų programoje. 2014-2018 metais studijavo Vilniaus universiteto Matematikos ir informatikos instituto doktorantūroje (Technologijos mokslai, informatikos inžinerija). Per paskutinius penkerius metus, kartu su bendraautoriais parengė ir išspausdino 16 mokslinių straipsnių. Už akademinius pasiekimus gavo Lietuvos mokslo tarybos stipendiją (2017 m.).

Daina Gudonienė

INTEGRATED E-LEARNING OBJECTS DESIGN MODEL AND
IMPLEMENTATION INTO EDUCATIONAL PLATFORM

Editor Giedrė Vasiljevienė

Daina Gudonienė

INTEGRUOTŲ ELEKTRONINIO MOKYMOSI OBJEKTŲ
KŪRIMO MODELIS IR DIEGIMAS EDUKACINĖJE
PLATFORMOJE

Redaktorė Jorūnė Rimeisytė-Nekrašienė

NOTES