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ABSTRACTS

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Linda Alksne[1], Lauris Cikovskis[2], Andris Ozols[2]
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Keywords: entropy, information theory, Matlab, video lecture

In this paper, the calculation of video lecture entropy is described using Matlab. Our Matlab entropy calculation includes both sound and video sub-channels. The obtained results are used to compare the entropy, structural information and capacity of different video lectures when they are considered as communication channels. These results further are used to analyse the correlation of video lecture structural information parameters with the known criteria of an optimal video lecture delivering students the maximum amount of information.

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E-LEARNING TOOLS FOR THE FLIPPED LEARNING IN ELEMENTARY SCHOOL

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Keywords: Flipped Learning, e-Learning, Information and Communication Technologies, Elementary school

Flipped learning is one of the types of blended learning in which technology combines with traditional education. Educational technologies and active learning methods are vital components of flipped learning, both of which significantly impact the learning environment. In the flipped learning approach, the teacher uses technologies to prepare work done by students outside the classroom as homework and for classroom work, organizing an active learning process, providing feedback, and formative assessment.

Flipped learning is a wide-spreads approach globally, and there are numerous studies focused on flipped learning in upper-secondary and higher education in different subject areas. Unfortunately, little research supports the incorporation of flipped learning in the elementary classroom and Information and Communication Technology tools appropriate for elementary school students. That is why the study's goal is to analyze Information and Communication Technology tools for flipped learning - video publishing and collaboration in the lesson and evaluate elementary school students' ability to use Information and Communication Technology tools.

There are many practical tools available to enable teachers to create a collaborative environment. Even though the technology is constantly changing, the tools presented here will give teachers an insight into incorporating and using technology when developing students-paced learning processes at home and an active, collaborative learning environment in the classroom. In this article's framework, the e-learning environment, the requirement for appropriate flipped learning tools in elementary classes is discussed, and empirical research data on age-appropriate technologies for primary school students are analyzed.

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EVOLUTIONARY PSYCHOLOGY: BENEFITS FOR ENVIRONMENTAL STUDIES

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Keywords: evolutionary psychology, environmental studies, ecotechnology

University level environmental studies, conventionally concerned exclusively with STEM field have been now more and more enhanced by social humanities (like psychology, anthropology, sociology). Psychological approach provides benefits for environmental studies since it a) facilitates an in-depth insight into evolutionary biology, ethology, ecology, parasitology, neurobiology, etc. natural science topics; b) stimulates students` creativity, moral sensitivity, cognitive openness and other skills relevant to successful studies and professional development; c) reveals ways to encourage sustainable public behavior as a key precondition to overcome global crisis (see e.g. Caldwell, 1999 for a symbolic justification).

Every organism`s habitus and behavior is shaped by its environment – accordingly, it has been argued that human mind should be interpreted within environmental context and, as a consequence, environmental psychology have to represent a paradigmatic framework for all the psychology science (see e.g. Gifford, 2014). More specifically, school of evolutionary psychology (henceforward – EP) states that our minds actually are adapted to the environment which does not exist anymore, i.e. to ancestral African savannah where humans have evolved – figuratively speaking, it means that "our modern skulls house a Stone Age mind" (Cosmides & Tooby, 1997). This "adaptive lag" justifies EP claims to be a grand meta-theory in psychology with an ambition to reveal the ultimate biological causes of human behavior. Despite EP statements have been still hotly debated among scholars, its basic positions could be used as a fruitful thinking tool for various problem-solvings, including environment related ones.

Within environmental studies at Liepaja University, EP inclusions cognitively support Bachelor and Master level courses (e.g. Biology, Ecology, Ecotechnology, Environmental Research Methodology) with a particular emphasis on the following *bio-triumvirate* – ecotechnology, biotechnology and biomimicry as mutually enhancing, vaguely separated fields of applied bio-science. Conceptually, this *bio-triumvirate* means involving bio-systems (organismic level system – biotechnology; ecosystem level one – ecotechnology) and their archetypes (i.e. bio-inspirations:

biomimicry) in ecological, health, management, design, etc. problem-solvings.

EP approach is enhancing these environmental studies through e.g. a) decoding roots of unsustainable / unhealthy behavior, b) demonstrating ways to sustain ecotechnological farming related lifestyle, c) presenting aesthetic values integration in ecological landscaping, d) encouraging creative, inspiring, "out-of-box" thinking relevant to biomimicry and ecotechnology research, e) developing nature therapy projects (see e.g. Summers & Vivian, 2018), f) revealing causes of Darwinian sexual selection, etc.

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INFORMATION SYSTEM FOR PERSONALIZED SPACED E-LEARNING

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Keywords: e-learning, spaced learning, information system, personalization

The latest movement of face-to-face learning to online learning, amplified by the COVID-19 crisis, raised challenges for the design of e-learning environments and technological solutions for the implementation of new pedagogical approaches in computer-based education. Spaced e-learning is one of the opportunities to implement the findings of neuroscience, psychology and cognitive sciences to raise the effectiveness of e-learning.

The spaced learning method is based on the positive effects gained from the rehearsal of learning content after several repetitions. The length of the spacing gaps in conventional education is always measured in terms of days or weeks. There are two approaches for spaced e-learning: long-spaced learning - similar to conventional learning methods (1) and short-spaced learning, with 10-to-20-minute breaks between repetitions. A mandatory requirement is the "disconnection" of the mind from learning content and the delivery of learning content in different forms for repeating. Such forms are for example text, video, simulations and interactive multimedia. Content that encourages the learner during spaces is used to "disconnect" the learner from learning content between repetitions.

The objective of the transdisciplinary research is to design an advanced information system for an innovative spaced e-learning methodology. The stages of the creation of the information system and the outcomes of the validation of the innovative technology are explained in the article. The following stages of research are carried out:

- Justification of the spaced learning method from transdisciplinary neuroscience, cognitive sciences and psychology research, emphasizing the short-spaced approach used in e-learning.
- The design of the first prototype of the spaced e-learning LMS in the OpenEdX MOOC type environment.
- An analysis of the outcomes from the implementation of the first spaced e-learning LMS in the master level courses for "Natural Science Modelling" and "E-pedagogy" in the Riga Technical University.
- Creation and implementation in practice of the advanced spaced e-learning information system, based on Google applications and Moodle

LMS for personalized content of spaces between repetitions of the learning content.

- Implementation of the TELECI method for the evaluation of the appropriateness of the learning process to the needs of learners and the learning objectives. The TELECI method has been created by the researchers of the Distance Education Study Centre of the Riga Technical University.

Research shows that personalization of the content of spaces in accordance with the individual interests of learners is a useful tool for the improvement of the acquisition of knowledge and skills. The information system created in the project could be adopted for different e-learning environments.

NOVELTIES IN TEACHERS EDUCATION AT LIEPAJA UNIVERSITY

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Keywords: teachers education, math teachers, distance learning and teaching

In study year 2020/2021 Liepaja University started to realize new Teachers' Education study programs. There are realized 4-year professional bachelor study program "Teacher" in various directions (Mathematics, Latvian, English, Science (Physics, Biology), Design and Technologies and Computer science) and one year study program for those who already have a bachelor degree in some field and would like to become a teacher.

The realisation of these programs was challenging because of remote learning process. Although an internship at school in remote form was a challenge both for students and their mentors, it gave students opportunities to acquire/improve skills of technologies usage and methods of distance education, what was not possible in a “normal life”.

In the report will be discussed content of these study programs and impressions of the implementation of study programs for the first year.

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SOCIAL MEDIA SUPPORTED E-EDUCATION: PERSPECTIVES AND INTERNATIONAL EXPERIENCES

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Keywords: social media, e-education, text mining, international cooperation

In recent years, classrooms have rapidly become virtual environments for knowledge and experience exchanging through digital tools in support of education. In times of crisis, we all recognize that the digital environment is the only one possible for online classes in schools and universities. Part of the toolkits that many prefer are social media. They have actively penetrated the daily lives of Internet users around the world and have become a necessary tool for communication, organizing and attending events, even training sessions. Our experience shows that many educators have to constantly adapt to the expectations of students to apply modern tools for knowledge exchange and teaching. The authors of this paper are interested in researching the accumulated international experience in e-learning, which integrates social media to achieve greater flexibility and attractiveness of the learning process. In this regard, the aim of the publication is to outline perspectives for the development of e-education based on the team's research in an international aspect, including the study of students' opinions.

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DIGITAL RIGHTS AND RESPONSIBILITIES OF STUDENTS IN THE FIELD OF HIGHER EDUCATION

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Keywords: digital rights and obligations, higher education, student, legal norms and sources

With the development of technology, modern society in its daily activities is increasingly moving from the real environment into the digital space, thus creating a digital society. The digitalisation of society involves the development of digital citizenship. Ensuring public security and social justice, the digital space is not possible without a regulatory framework that governs individual behaviour, i.e. the provisions of the national legal framework that define the limits of an individual's freedom, security and justice, as well as his or her responsibilities. Thus, it goes without saying that in the digital environment, too, the citizen has the right to privacy and freedom and certain responsibilities laid down that help him or her to build relationships and understanding with others, achieve goals and realize themselves in the digital space. One of the active users of the digital space is students, who are defined in the regulatory enactments as one of the subjects of education, and who can be assessed as a target group endowed with a relatively high level of digital user skills. Simultaneously, it should be noted that there is little research conducted on the level of knowledge of this target group concerning digital rights and obligations.

The work aims to study the rights and obligations of the digital citizens in the field of higher education and learn what sources of law regulate them.

The article evaluates the legal framework of the digital space and the division of responsibilities in the field of education: the rights and obligations of digital space users, i.e. students of the higher education institutions in Latvia, are analysed.

The results of the research show that students do not have a sufficient level of knowledge and understanding of their digital rights and responsibilities. Digital rights and obligations are set out in various legal documents and sources.

The results of the study make an important contribution to raising awareness of the rights and responsibilities of the digital space, thus promoting the development of citizens' knowledge, helping them to be active and participatory citizens in the digital environment (space).

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CHALLENGES OF AUTOMATIC GRADING OF LABORATORY REPORTS IN MOODLE

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Keywords: Moodle, laboratory reports, automatic grading

Moodle is widely used in education. This research shows how Moodle can be applied to grade laboratory reports. The study shows that only predictable results can be automatically graded in Moodle therefore all laboratory works have to be customized if instructor chooses to grade students reports automatically. Every part of laboratory report can be made as a separately gradable section, especially if the results are graded manually.

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DEVELOPMENT OF LABORATORY KITS FOR PHYSICS AND ENGINEERING STUDY COURSES

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Keywords: laboratory kits, distance education, laboratory work

During distance learning it is necessary to implement laboratory work in various study courses. Some of the practical work can be replaced by simulations, but use this approach has to be considered very carefully, as research shows that students may get a misconception about the real measuring process. Understanding the basic concepts does not require complex and large equipment. Therefore, a good solution is to provide students with kits for laboratory work. When creating such kits, a great deal of preparation is required and all possible problems that students may face should be considered.

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DEVELOPMENT OF MOODLE PLUGIN FOR LABORATORY WORKS IN PHYSICS

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Keywords: moodle plugins, PHP, HTML, laboratory works

The Moodle environment is widely used in various study courses, mainly to place materials and create tests. There are plugins to integrate various simulations, virtual and remote experiments in a moodle environment. Laboratory work and experiments require data processing and visualization. Implementing these sections in moodle is not common, but there are various examples of how to implement them. Moodle plugins can be created, but knowledge of PHP and HTML is required.

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PROGRAMMING COMPETITION AS INTEGRATED PART OF IN-SERVICE TEACHER TRAINING AT LIEPĀJA UNIVERSITY

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Keywords: programming contest, teacher training, distance education

Due to recent development trends of the national education in Latvia, technology-oriented competences and programming skills has played more essential role in school curriculum. As response to the current situation, the demand for teachers skilled in software coding has been growing dramatically during the last three years. The staff members of Liepāja University have developed the intermediate course in programming aimed to improve Computing teachers practical skills. In order to increase teachers' learning motivation, the course combines programming competition with learning of advanced theoretical topics and practical exercising.

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THE PROTOTYPE VERSION OF THE COMPUTER PROGRAM FOR PSYCHOPHYSIOLOGICAL TESTS

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Keywords: computer program, prototype, information system, data processing, database

The research's main idea is developing a computer program (prototype) for calculating and analyzing segments in psychophysiological tests based on some artificial intelligence methods. The computer program can help assess the development of children's psychomotor skills, especially children with learning difficulties and visual perception. This program will process data tens of times faster and receive data for further analysis and a proposed solution for each person. The main feature of modern society is modern technology, in the shortest possible time with minimal cost. A prototype of the computer program will allow you to experience these benefits fully. The first version's developed prototype gives an idea of a computer program's operation, the implemented schemes of work, the relationship between the database and the information system. To achieve the goal of the research, the following basic research methods will be applied: research of theoretical data in the form of descriptive analysis, content analysis and the comparative method; mixed methods, both qualitative and quantitative research methods - use of documents, case studies, surveys, focus group discussions and interviews with target groups, experimental and practical testing of recommendations; analysis methods such as descriptive, statistical and others.

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ON THE DEVELOPMENT AND APPLICATION OF A MOBILE 2D ROBOT FOR DATA ACQUISITION FROM OPEN AQUATORIUMS

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Keywords: mobile robot, aquatoriums, environmental parameters

Aquatoriums monitoring requires mobile remote-controlled robots capable of collecting environmental data. For routing of a mobile 2D device created at the Liepaja University GPS coordinates for autonomous control are used. In environmental research, they are the depth of the water area, the temperature at different depths, the transparency of water in the optical range, salinity, pH level, the content of dissolved oxygen. The above data is read, structured, and linked to the GPS coordinates and stored in the on-board memory device. This data structure allows to visualize data and obtain 3D mappings. Data analysis can be used to control management works, can serve as a basis for forecasts of environmental parameters, climate change, detection of local pollution and other environmental measures.

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EXPLORING THE BENEFITS AND CHALLENGES OF LEARNING ANALYTICS FOR THE COURSE DESIGN IMPROVEMENT

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Keywords: learning analytics, course design, quality, evaluation, higher education

As a global pandemic shifted all education activities to the online mode, all institutions have learnt their lessons and adapted to the challenging situation. The change has required reshaping the courses, materials, activities and students' engagement practices. It led to the revision of course design and methodologies applied. Researchers widely discussed the course design from different perspectives. One of the most crucial challenges is the course's quality, and learning analytics is one of the prominent avenues to take in the field. Although learning analytics is at its infancy at the HE education level, it contributes to data-driven decision making.

The aim of the paper is twofold: first, it presents the findings of the literature review on the benefits and challenges of learning analytics for the HE sector. Second, it presents the results of the pilot experiment regarding the improvement of the course design. The experiment framework comprises two cases. The first case presents possible insights about the quality of course design solely based on data from learning analytics. The second case describes the course design's quality based on both data from learning analytics and a survey including specified criteria. An analysis from different perspectives helped explore the relationship of gathered information and minimized the variety of interpretations if it would be done solely based on data from learning analytics. Although the pilot experiment is limited to the number of courses included and a small sample, it provided significant insights into the benefits and challenges of learning analytics as a tool for course design improvement and course design quality interpretation.