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Financial implications of storm damage to coniferous forests in Latvia

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INTRODUCTION

Storms are the primary factor reducing carbon sequestration in Europe's forests, thus negatively affecting the ability of countries to fulfil their targets related to greenhouse gas balance (emission *vs*. sequestration). The impact of storms is rising due to an increase in forest cover, a preference for less wind-firm species (namely the Norway spruce) as well as the aging of forests in Europe (leading to greater vulnerability). Furthermore, climate change will affect the amount of damage. The frequency of windstorms and/or high speed wind gusts is expected to increase. The largest storms in our region occur mostly in autumn/winter – in the future this is likely to increase due to conditions in which it is more likely that tree anchorage is weak, due to the soil not being frozen and being saturated with water. From a sustainable forestry perspective, it is important to note that recreational use of those forests affected by storms as well as secondary damage (e.g. by bark beetle) will also be substantially reduced. Forest owners suffer direct financial losses as a result of storms. The aim of this study is to estimate the losses caused by storms and evaluate measures that could be used to reduce storm damage.

MATERIALS AND METHODS

Forest owners suffer direct damage as a result of a loss of timber value from stem cracks (which is estimated to account for 20% of the volume of first (bottom) logs reduced to fire-wood quality), increased logging costs as well as additional regeneration, tending and precommercial thinning. The cost of these processes and the timber prices used in calculations are obtained from the Central Statistical Bureau of Latvia; information on the amount of timber damage during storms in the last decade is provided by the State Forest Service. To obtain information on the possibility of reducing storm damage, growth models (LSFRI Silava) are used in addition to assessments of vulnerability to storm damage (ForestGALES). The financial impact of damage-reduction measures is given as equivalent annual annuity (EAA) - interest rate 4%.

RESULTS

During the last decade, windstorms in Latvia alone have caused direct economic losses to forest owners of around €164 million, an average of €9 per m^3 of wood from salvage logging. Vulnerability to damage increases as tree height increases (as critical wind speed decreases). Lower planting density slightly increases the critical wind speed (by 3-9%) (for Scots pine: 1500 trees ha^{-1}*vs* current 3000 tree ha^{-1}) and notably reduces the financial impact of storm damage: EAA for pine stands planted on the best soils is €15 ha^{-1} with sparser planting, and -€11 ha^{-1} with denser planting. If final harvest is planned by the stand age (101 years in majority of cases in Latvia), the financial impact of wind damage is higher in the best growing pine stands (site index Ia): in sparse stands the affect of wind damage reduces EAA by 38%, while stands with a lower site index are reduced by 25%. The reason for this is that faster-growing trees reach certain height, at which they are vulnerable to smaller (in terms of m s^{-1}) critical wind speed, at earlier age. For example, the above-mentioned sparse Ia stand has a critical wind speed of ≤20ms^{-1} for 38% of its total rotation period, compared to 26% for the I stand. Thus, harvesting by constant age reduces the financial gain from the best-quality sites and silvucultural treatments aimed at increasing tree growth (e.g. planting best-growing genotypes). Therefore, harvesting by target diameter is recommended.

CONCLUSION

Major damage to forests mean owners are less willing to invest – thus reducing future potential wood flow for the industry. Therefore, changes in legislation concerning criteria for initial stand density and target diameter are recommended to minimize the negative economic impact of climate change (adapt).

KEYWORDS

Wind damage, financial loss, rotation period.

Learning Agility as a Predictor of High Performance and Potential: A Case study from Healthcare Industry

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INTRODUCTION

Term "learning agility" was first introduced by Lombardo and Eichinger (2000). It is defined as the willingness and ability to learn from experiences, and subsequently apply that learning in new situations to perform successfully under new or first-time situations. Learning agility is heavily used for talent assessment and development and succession planning in multinationals worldwide, but for Latvian local companies it is not yet a daily human resources practice. Very little scholarly research has been conducted on this construct worldwide and in Latvia. In the turbulent business environment, the company leaders need to be more agile than ever. Leaders should adapt to new business strategies, working across cultures and dealing with virtual teams.

Various studies suggest that learning agility is a better predictor of high performance. Connolly & Viswesvaran (2002) suggests learning agility is a better predictor of high performance as compared to IQ and personality traits. It has also been found that learning agile leaders are more successful in dynamic, turbulent workplaces (Dai, De Meuse, & Tang, 2013). There are five major factors of learning agility - mental agility, people agility, change agility, results agility and self-awareness (Swisher et al., 2013). As described by Mitchinson & Morris (2012) at Columbia University research there are four behaviors that enable learning agility (innovating, performing, reflecting and risking) and one that derails it (defending). In the same study no significant differences were found in learning agility scores across gender, age or organizational level.

The scientific support of a linkage between learning agility and leadership seems to be scanty. Results of a meta-analysis by De Meuss (2019) show learning agility has a robust relationship with both leader performance (= 0.74) and potential (= 0.75). In this study it was hypothesized that learning agility will be positively related to annual performance ratings.

MATERIAL AND METHODS

The author was reviewing talent management process for three consecutive years – 2011, 2012, 2013 - and high potential employee identification for a local branch of a global innovative pharmaceutical company in Latvia. The company has a solid talent management process in place and devotes time and resources to the development of identified talents. Up to three times a year, Talking Review sessions are conducted to identify and develop their high potential employees around the world.

Talking Review is a facilitated session where people managers openly discuss and calibrate talented employees in terms of performance, potential, readiness, willingness, and mobility. During a typical session, line managers carefully assesses candidates using a 9-cell performance-potential matrix (see figure below). Each candidate is placed in a cell based on ratings of their performance during the past years and a discussion revolving their perceived level of learning agility.

The researcher collected learning agility scores and annual performance ratings on 33 managers located in Latvia. A mean performance rating was computed based on the three years – all 33 employees were at managerial level.

RESULTS

A positive relationship between learning agility and ratings of performance was observed. It was observed that the percentage of candidates classified as highly learning agile increased over time, ranging from 16% (2011) to 22% (2012) to 18% (2013). It suggests that as the company implemented the Talking Review process, decision makers learned from their experiences, calibrated their evaluations, and improved their accuracy in identifying their high potentials candidates.

DISCUSSION

The case study certainly holds several practical implications for the researchers as well as the practitioners. There are need for empirical studies to be conducted in this area. Caution should be exercised before drawing firm conclusions about these findings since the study included no controls for a manager's commitment to change, the extent of the line manager's support for such change, or the culture and structure of the organization and its possible influence on learning agility. Regression to the mean also might have played a role in the results.

CONCLUSIONS

The present paper and case study is an attempt to explore the relationship between learning agility and high performance. A positive relationship between learning agility and ratings of performance was observed. This understanding of the relationships among all these factors will further add to the existing knowledge on these constructs and help the organizations to execute leadership assessment in a better way.

Scholars should provide new ideas for understanding and conceptualizing learning agility. Human resources professionals and executives in organizations should provide access to high-potential employee data and performance, so a more rigorous process can be applied to understanding the linkage between learning agility and leader success (or derailment).

KEYWORDS

Learning agility, talent management, leadership development, succession planning

The Strengths and weaknesses of financing social protection in Latvia

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INTRODUCTION

Public social protection spending in Latvia amounted to 15.2% of GDP in 2016. Financing social protection in terms of PPS per inhabitant was only 35% of the average amount in the EU-28 in 2016. The explanation for such a permanently low level of social protection funding is not only a modest level of economic development, but traditionally a low priority of social spending in Latvian politics. The analysis of changes in the financing level of social protection, the changes in the main sources of social protection, the impact of past reforms is in focus. The wide variety in financing structures of social protection systems across Europe and the different levels of financing provides an opportunity to better understand the specifics in Latvia and its mixture of sources of financing social protection system.

METHODS

The author uses data from ESSPROS, the State Social Insurance Agency, the Ministry of Welfare for 2005-2017 for Latvia and the EU28 and is doing analysis of secondary statistical data, public policy documents, analysis of legislative acts and Cabinet Regulations from 2005-2018.

RESULTS AND DISCUSSIONS

The social insurance schemes are based on the pay-as-you-go principle and the distribution is achieved between the present contributors and the present recipients, at the same time the benefit amount is closely linked to the contributions paid by a certain individual. Such a system creates proper work incentives, albeit requires significant resources for its administration. The State Social Insurance Agency showed an excellent performance in dealing with this task. Latvia's experience with the micro-enterprise tax regime demonstrated the pitfalls of an over-simplified approach to taxation, when the measure, aimed at combating unemployment, became a tax evasion trick at the cost of the workers' social security.

The strong side of the existing model of financing social protection is its ability to maintain a positive balance even in the background of a very turbulent environment. The sustainability of the social insurance budget has always been and remains a top priority for policy-makers. Social contributions play the leading role in the existing mix of financing social protection. The share of old-age function benefits is higher than the EU28 average. The expenditures on some functions grew faster: spending on disability benefits increased by 99%, on unemployment by 75%, on old-age and family benefits by 64%. The last decade demonstrated a trend to an increasing role of the general government contributions. The social contribution rates are already quite high (35.09% in 2018) and can hardly be increased, otherwise labour costs might become uncompetitive. Therefore, a further increase of general government contributions seems unavoidable.

CONCLUSIONS

Trends in reforms and policy changes were diverse and even contradictory: cost saving, support of specific target groups, reallocating funds in financial flows, an increase of the pension age. A number of policy adjustments were based on the lessons learned during the crisis. Means-tested benefits are thinly represented in the Latvian social security system, and the thresholds used for their calculation are inadequately low. The Latvian healthcare system is chronically underfinanced. It also has a high ratio of out-of-pocket co-financing by patients. Austerity measures had a strong influence on social protection expenditures from 2009–2014. Among the weaknesses of the social insurance schemes, one should mention the inadequately low minimum levels of benefits, especially as concerns old-age pensions. Low wage earners might have a disincentive to diligently pay the contributions, seeing that even the average old-age pension is lower than the at-risk-of-poverty threshold.

KEYWORDS

Financing the social protection system, tax-based, insurance-based.

Input determination for models used in predicting student performance

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INTRODUCTION

Student performance prediction has become a viable means to improving academic performance and course content in online learning. Predictive models such as neural networks, decision trees and linear regression are used to transform inputs (e.g. past performance, social background, learning system usage patterns, test results) into outputs (course completion, expected grade, difficulties encountered, personalized suggestions). Often, the existing quantitative data drive model design, especially when applying such models to the conventional classroom and the person delivering the course, is a passive participant in designing models and delivering data.

In seeking to capture and code as much student behavior and environment as possible to apply learning analytics to a mostly conventional classroom, the most successful inputs (predictors) among existing models can be identified, categorized and their common characteristics determined. Together with a study of formative and summative assessment methods (e.g. types of feedback and how it can be captured) and factors affecting student performance in the classroom (e.g. environmental factors), this allows to identify the existing data in classrooms that are not captured by current learning management systems, thus allowing the expanded use of learning analytics and student performance prediction in traditional classrooms, with a focus on personalized suggestions.

The goal of the paper is to identify patterns among inputs used in existing models of student learning (based on online learning and learning management system data mining) that can then also be applied to the traditional classroom.

Research question: how can characteristics common to effective predictors of student performance be used to identify predictors among data produced in the traditional classroom?

MATERIAL AND METHODS

A literature review is performed where inputs captured and features discovered in existing learning analytics systems are characterised, along with methods used to identify those and the modelling approaches employed.

An attempt is made to identify measures in online learning that may have analogues in the traditional classroom (e.g., seating patterns and communication in chatrooms) or for which proxies may be found (e.g. screen size and lighting quality, where the proxy is the classroom number).

The corresponding outputs are recorded where possible, with a focus on those that allow providing feedback for individual students or for course/curriculum deliverers/designers (i.e. allow to improve the success of future students in this course).

RESULTS

Successful predictors and characteristics common to those are identified, so that they can be used in features engineering for student performance prediction models.

Predictors used in online learning are categorised, so that analogous inputs can be developed for use in traditional classrooms.

Types of feedback provided by existing models of learning are identified, where possible, along with the corresponding input (weights of inputs).

Studies are identified where learning personnel, not the researcher, were able to drive the model development process.

DISCUSSION

Recently, there has been increasing focus on increasing the visibility into models of learning and of involving learning personnel in designing, modifying and running those models. Providing inputs and recognizing the features they represent determines the success of such models. Therefore, recognizing existing successes and applying them to formative assessment methods may be a means of recognizing additional inputs to and features used in models, while involving educators. Applying learning models to the traditional classroom as an integrated part of the learning management (school record keeping/grading) systems may allow to expand their use, while simultaneously increasing the predictive power and effectiveness of (personalized) suggestions, both by using existing data, and by providing tools for educators to transform the existing feedback they provide into data than can be used as inputs for models.

CONCLUSION

Predictors used in learning models in online learning can be applied to the traditional classroom. Analogues may be found for predictors that are not available in the conventional classroom. Common characteristics and categorisation of predictors may be used to identify predictors among existing data, including data provided by students (e.g. formative feedback) that is not captured by the existing learning management systems used.

KEYWORDS

Online learning, input selection, prediction model.

An Integrated Approach for Socio-Technical Systems Analysis by the Application of a Web Map Solution

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INTRODUCTION

Socio-technical systems modelling and analysis are playing an important role for sustainability and scenario evaluation in different situations and domains – environmental modelling and simulation, agricultural management, tourism simulation, educational purposes and many others. There are many challenges when scientists are faced with a practical systems simulation modelling situation. These challenges are on choosing an appropriate simulation modelling tool according to the particular situation and on-site integration of a large amount of data in the simulation environment. An option for that particular challenge is to develop a solution by the application of multiple modelling approaches and by integrating them with the Web map application to provide the online data needed for simulation processes and the analysis of different scenarios or outcomes.

The aim of this paper is to present the results of interdisciplinary research done in collaboration with scientists in environmental modelling and the socio-technical systems engineering fields.

MATERIAL AND METHODS

Enterprise modelling as a model development tool is used to provide a holistic understanding of the mentioned domain. In the case of policy makers, the application of 4EM methodology and incorporation of a simulation modelling environment offers a comprehensive tool to influence relevant policies and regulations on the basis of the best available information and the outcome of different scenarios.

Modern web map applications provide an interactive form of data presentation, especially in the case of spatially related data. On the one hand, the user can easily define inputs to analyses and on the other hand, results of the analyses and simulations are presented in a way that the user can extract information on different levels.

RESULTS

As an outcome of this research is an integrated approach for socio-technical systems analysis which is applied in a Web Map Application to provide online visualization of the data provided in the form of maps, charts and tables.

This application also provides a participatory tool that involves scientists and members of the general public, working together to develop conceptual and dynamic models to address environmental issues. The parameters and conditions of these areas are continuously changing.

The enterprise modelling approach in combination with simulation tools and utilization of a modern web map application provides an active research tool in situations when many stakeholders are involved in building a comprehensive model and to get the most benefit from its outcome.

It also provides a holistic view of environmental processes and their influence on residential activities in the protected landscape areas.

A practical result of this paper, the solution designed and developed during the research was tested in a real life situation in Kala lake with inputs provided by the management board of the lake and an environmental agency. Visualization of the results in the form of an interactive web map application provided an explanatory and straightforward presentation of the results for an expert group, as well as for the general public.

The developed web map application combines the visualization of the results in the form of charts and tables with the visualization of spatially related phenomena as data layers in a map window, with other map layers from different data providers. On the other hand, the web map application provides functionality for users to insert the parameters of analytical methods and simulation tools to improve the results from previous iterations and/or additional conditions to the computations.

DISCUSSION

The advantages of the presented approach is to combine mathematical operations and simulations in the background while the results of these background operations are presented using graphical and cartographic methods in an explanatory form for a variety of users. The expansion of the utilization of web maps in recent years provides an interactive way to present information and to extract knowledge that are important as a support for further decision- and policy-making processes.

CONCLUSION

Future work is related with the application of a multi-approach in the socio-technical systems analysis, simulation, verification and validation processes. The interoperability of different modelling software would expand the functionality of the proposed software.

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KEYWORDS

Socio-technical systems, web map application, simulation modeling, modeling approach, multi-approach modeling, enterprise modeling.

Dynamic System Sustainability Simulation Modelling

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INTRODUCTION

Assessing the sustainability of dynamic, open and complex systems with many stakeholders, interrelated components and interactions and forecasting with traditional study methods is complicated and has its limitations. Therefore, often researchers, when forecasting the sustainability of a dynamic system, rely on subjective judgment without references to assessment standards.

The aim of the paper is to create an imitation model for the sustainability of a dynamic system in order to assess and forecast the sustainability of the system under alternative development scenarios. It includes 3 main aspects - how sustainable is the dynamic system, what is the level of sustainability of a dynamic system under alternative development scenarios and what additions are needed to improve the functioning of the imitation model.

The research question of the paper is: what imitation model can effectively analyse and forecast a dynamic system in the case of the tourism object Cesis Palace.

Sustainable development researchers offer to build on traditional principles and interlinked dimensions of sustainable development: environment, economic and social, and adapt them to the dynamic system, which is characterized by the interactions between components (Tanguay et.al., 2011; Mai, Smith, 2018). One type of study that helps explain such systems is simulation modelling, which is often used when researching the interaction of dynamic systems (Johnson, 2011).

MATERIALS AND METHODS

The Cesis Palace complex as a tourism site was used in the paper for an example of a dynamic system, since tourism is both a dynamic system with many interlinked components and equally important are the three dimensions of sustainability for its long-term development.

During the study, multiple data acquisition methods were used: a structured interview, analysis of statistics, case study analysis and an expert interview on the created imitation model.

To achieve the goal of the research, a model of a tourism sustainability imitation model was created using the STELLA dynamic system modelling environment. The model and the selection of indicators were based on the three key sustainability dimensions: economy, environment and society/culture.

RESULTS

The result of the work is a computer model that helps to assess the sustainability of a real-life system and its dimensions by entering data generated during the study. It concludes that the tourism object under consideration is potentially sustainable. Simulating alternative development scenarios, it can be concluded that the elements of one group of indicators can affect both the sustainability level of their own dimension, as well as the indicators of other dimensions and their sustainability level, as well the sustainability of the system overall. Significant changes in the system take place in a situation where a number of indicator groups are affected by the changes.

DISCUSION AND CONCLUSIONS

In order to use this model further, it would be necessary to develop an improved methodology for evaluating model indicators.

To ensure a more efficient model performance and data quality, data security and integrity should be taken into account. Creation of an imitation model requires the acquisition, processing and issuing of large amounts of data that are exposed to data security and integrity risks, which may have a negative impact, not only on the functioning of the model, but also on the system itself.

To significantly improve the definition, selection, value assignment, and to more accurately identify the importance of interfacing elements and to express future forecasts, the author proposes to evaluate the use of machine-learning in imitation modelling. Machine-learning algorithms are increasingly used by researchers in mechanical engineering applications.

KEYWORDS

Dynamic system, simulation modelling, sustainability

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Digital Era in Cross-Sectional Human Anatomy: The Use of Detailed Images in the Study Process

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INTRODUCTION

An increasing number of digital technologies have been introduced which assist in some practical aspects of the teaching and learning of Human Anatomy. For modern-day students, more and more cross-sectional images of the human body are available as materials in their studies. Digital 2D images and/or 3D images such as high-resolution computed tomography (CT) scans and magnetic resonance (MR) have been received with much enthusiasm and have found their way into anatomy courses and practical classes. An emphasis on sectional anatomy can help medical students develop and improve their knowledge of cross sectional imaging.

The aim of this study was to assess and verify the impact of cross-sectional images on the study of Human Anatomy.

MATERIALS AND METHODS

200 medical students in their 2nd study year at Rīga Stradiņš University were included in this investigation in 2018. In practical classes, all students were asked by tutors to identify several anatomical structures using "Anatomage", a 3D virtual dissection table (USA). They were randomly divided into two groups: Group I analysed cross-sectional images of the human body after cutting and segmentation with interactive tools; Group II studied X-rays, CT scans and MRI images of different regions and systems. Similar images in all possible cross-sectional planes were displayed. The pathological findings from the cross-sectional images were used to develop several clinical questions and cases. At the beginning of each practical class, the tutor spent about 30 minutes demonstrating the themes in the images to all the students. At the end of the teaching session, their understanding of the relationships between anatomical structures and the rate of cross-sectional image effectiveness among both groups was assessed by means of discussion.

RESULTS

By this time, students were able to identify the position of bones and organs from the lectures, practical classes and dissections. The majority of students recognized the landmarks, anatomical structures and relationships between them on cross-sectional images in three planes. By removing different kinds of tissue, students in both groups were able to learn more difficult anatomical topics and to explain details in these complicated regions. Self-assessment exercises helped students verify their understanding of topographical relations and regional anatomy. In these groups, students with less prior anatomy experience wanted to focus more on the basics of anatomy whereas students with more prior anatomy experience wanted to see and study more complex and interactive materials in cross-sectional images.

CONCLUSION

This study demonstrated the role of the 3D virtual dissection table "Anatomage" in facilitating students' ability to interpret cross-sectional images and understand the relationships between different anatomical structures. All the X-rays, CT scans and MRI cross-sectional images used played an important role in the teaching and learning of Human Anatomy. Skills and the ability to interpret these medical images is important for the application of anatomical knowledge right from basic studies until clinical courses.

KEYWORDS

Anatomage, human anatomy, cross-sectional images, students

Development of a microscopy slide system of basic subjects for inclusion in e-studies for medical and dentistry students

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INTRODUCTION

Medical and dentistry studies are time-consuming and require patience and perseverance. The study of basic medical subjects including Histology with Cell biology and Embryology require the possibility for regular study of tissues and self-evaluation which should not be limited in time, and should not be limited to classroom time. Furthermore, official slide-sets for the above-mentioned subjects often contain incomplete cell, tissue and organ slides which do not allow a full understanding of the teaching subjects. Thus, our aim was the development of a microscopy slide system for basic medical subjects to be included in e-studies which are accessible to medical students anywhere and anytime

MATERIALS AND METHODS

We planned to use 220 slides in Histology and 80 slides in Embryology. For the scanning process a Glissando Slide Scanner was used (Objective Imaging Ltd., UK). Slide images were then processed using Adobe Photoshop 7.0.1 Update and Paint.Net Software. A description of the slides was evaluated by three tutors, independent experts and IT specialists and all slides were transferred/incorporated into the Riga Stradiņš University e-study system.

RESULTS

The result was the development of 786 high quality digitalised slides with easily changeable magnification for two subjects: 372 new slides for use in Histology for the Medical faculty (MF) and 290 new slides for use in Histology for the Dentistry faculty (DF); 65 new slides for use in Embryology for the MF and 59 slides for the DF. Additionally, the quality of 230 Histology slides and 99 Embryology slides previously scanned using a press scanner were improved. Furthermore, descriptions of each slide were given in Latvian and English for easier orientation and to facilitate independent study. Altogether, slide descriptions were prepared for 16 2nd semester labs and 15 3rd semester labs in MF Histology, while the DF received 14 descriptions for 1st semester labs and 8 descriptions for 2nd semester labs in this subject. In Embryology, 6 lab slide descriptions for the MF were used and 5 lab slide descriptions for the DF were used. All slides were also marked with a special university watermark. The slide-set introduction contained a warning to students regarding copy/reproduction rights . In the end, the addition of slide study to e-studies was very highly evaluated by Latvian and foreign students in student feed-back questionnaires at the end of their studies in basic medical subjects.

CONCLUSION

The inclusion of Histology and Embryology slide-sets in e-studies allows an absolutely indispensable possibility for modern, independent study in medicine, saving the time of students and tutors outside the auditorium and creates the possibility of increasing the number of students in the classes. The digitalisation of high quality slides allows the development of many variations of basic teaching slides and expands teaching explanations in this way. The existing digitalised slide-sets and their descriptions can easily be changed if needed. However, the minus of such digitalised slide-sets in e-studies is that violations of university property copy rights by students cannot be excluded.

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Measuring Teachers-As-Learners' Digital Skills And Readiness to Study Online for Successful e-Learning Experience

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INTRODUCTION

We are living in the information society and digital competence is one of eight key competences for lifelong learning strategies (European Competence Framework); it is "*both a requirement and right of citizens, if they are to be functional in today's society*" [1].

The project "Competency based curriculum" is supported by the European Social Fund (ESF) and implemented by the National Centre for Education (NCE) of Latvia. E-learning course modules are to be developed and implemented for the professional development of all teachers in Latvia (pre-primary, primary, lower secondary and upper secondary school) [2]. These e-learning courses will be available as self-directed learning (SDL) courses.

Latvia is facing a challenge – lifelong learning participation rates are very low. According to *Eurostat*, in 2017 only 7.5% of Latvian adults (age 25-64) participated in any lifelong learning activity, compared to 10.9% in the EU as a whole [3].

For sustainability of the ESF "Competency based curriculum" project, it is important that all teachers take part in e-learning - NCE does not have sufficient funding to organize face-to-face training for more than 35,000 teachers in the country.

Hypothesis. The level of teachers-as-learners' readiness to study online varies significantly depending upon their demographic and professional characteristics – e-learning course design must be adapted to the learners' readiness level and skills to achieve the best possible completion rates.

There has been research on learners' readiness for online learning and on the assessment tools [4]. Teachers-as-learners are different from traditional students; research on teachers-as-learners in the online environment has been limited. [5]

MATERIALS AND METHODS

Theoretical sources and other available research on learners' readiness for online learning and teachers-as-learners were analysed.

A self-evaluation survey was developed for teachers based on TOOLS [6] questionnaire. After exploring several options available, this tool was selected because it is open source and easy to replicated, scoring scheme and explanations were also available. According to the authors of TOOLS [7], the measure has a stable and simple structure, the criteria and construct have been validated, and test-retest reliability has been tested.

Teachers from 100 pilot schools in the ESF "*Competency based curriculum*" project were invited to take part in the survey in November 2018. Within one month, responses from 1092 teachers from all over the country, of all education levels and of all subject areas were received, collected using Microsoft Excel and processed with IBM SPSS® Statistics software Version 20 [8].

To analyse the data, several statistical techniques have been used: descriptive statistics, univariate analysis, T-test, Mann-Whitney test, One-way ANOVA, Post-hoc comparisons, Kruskal-Wallis test and others.

RESULTS

Five summarized variables out of six distributed normally (Kologomorov-Smirnov test <0.01); one summarized variable did not distribute normally.

Statistically significant differences were not found between genders in four of five summarized scores.

Statistically significant differences between subject areas of teachers were found.

Significant differences between age groups were found.

DISCUSSION

Designers of e-learning courses for teachers-as-learners should be mindful of the various levels of readiness for online learning and the various competences and skills of the learners.

Future work:

- Continue analysing the data in search of relationships between the readiness to study online and other professional characteristics of the teachers-as-learners;
- Analyse theoretical sources and other research about e-learning course customisation for teachers-as-learners.

CONCLUSION

This research adds to the theoretical framework of readiness for online learning, especially when analysing teachers-as-learners.

KEYWORDS

Adult learning, e-learning, readiness for online learning, online learning, teacher training, course design.

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The intensive management of Norway spruce: a compromise between financial gain and genetic diversity?

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INTRODUCTION

Norway spruce (*Picea abies* (L.) Karst.) is a high-yielding commercial tree species grown in the Baltic sea region. It not only ensures timber production, but also provides a notable amount of crown branch biomass and a substantial amount of technically accessible stump biomass for energy. Thus, it has a high potential as a source of renewable materials and energy in the bioeconomy. Recent studies in Latvia have shown no long-term negative consequences to forest ecosystems from whole-tree harvesting. Hence, this management method can be considered sustainable for Norway spruce stands in fertile mineral soils. Not only yield, but also risks need to be considered to ensure financial sustainability, mainly the impact of wind-storms, drought, and pests. A combination of silviculture and genetics (tree breeding) can be used to reduce the probability of damage to Norway spruce stands. The aim of our study was to assess the potential of simultaneously ensuring both genetic gain and diversity in Norway spruce plantations.

MATERIALS AND METHODS

Data characterizing/showing tree growth – current height, diameter at breast height, survival, as well as radial increment (increment cores) – were obtained from a 50-year-old Norway spruce plantation. Data characterizing genetic diversity were collected from a gene reserve stand (48 trees), Norway spruce seed orchard progenies consisting of 20 clones, as well as 12 pure Norway spruce stands. DNA was extracted and analysed with 6 to 14 nuclear SSR markers.

RESULTS

No significant differences were observed between the seed orchard progenies, the trees from the gene reserve stand and other Norway spruce stands using the assessed parameters – allelic richness, observed heterozygosity, genetic diversity and relatedness. This indicates that the use of a seed orchard containing a relatively low number of clones as a seed source for plant production and forest regeneration would not have a negative impact on genetic diversity. However, notable gains in productivity can be achieved using selected plant material. At the age of 50 years, phenotypically selected clones in the low-density (5×5m) plantation had a mean yield of 327±42 m^3ha^{-1}, significantly exceeding the mean yield (277±56 m^3ha^{-1}) observed in Norway spruce stands of the same age and the same site conditions (forest type), while no significant differences were observed compared to the average stand yield at the age of 80 years (347±47 m^3ha^{-1}). The target diameter of 31 cm was reached at the age of 42±0.9 years on average, but this varied significantly among clones.

CONCLUSION

The results demonstrate a notable potential to reduce the rotation period, thereby: a) increasing the availability of raw material for further processing and energy production, and b) reducing financial risks due to lowering the probability that the stand will sustain substantial damage (i.e. wind storm). This gain can be achieved without significantly compromising genetic diversity. Further studies shall address potential changes in genetic diversity at the landscape level over a longer period when using a very limited set of clones. Stands in nature reserves could serve as a basis for comparison in such studies.

KEYWORDS

Timber production, breeding, risks

Mobile Apps for teaching Physics: using applications in Latvian schools

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INTRODUCTION

Observed trends in education: the focus is set no longer on how to acquire the technical skills of using mobile apps, but on the methodological skills of using mobile apps, which requires continuous support from the school's administration and a significant amount of time to invest directly in developing the teachers' professional competence, which in turn can be realized with appropriate learning resources. When using technologies to develop young people's skills necessary for the labour market, it is not enough to invest in the acquisition of technology; the use of technologies should be aligned with both the specific content of the subject and its teaching methodology. Teachers of physics do not have sufficient methodological support and practice in the purposeful use of mobile apps in the learning process. Frequency of technology use and purposefulness in the learning process are often discussed. It is also necessary to consider that their integration in the learning process takes time – so that the teacher can acquire the opportunities offered by technologies both technically and methodically.

Limitations of the Study: Reaching Physics teachers who had experience with mobile app integration, more specifically, using mobile apps in the Physics subject context was quite difficult since education, indeed, mobile app use in Physics education is relatively new for the Latvian education context. The small number of participants (teachers) limited a diversity of the data collected in terms of criteria referred while selecting mobile apps.

MATERIAL AND METHODS

For further analysis, all the responses of the participants for the interview was imported to SPSS qualitative data analysis software. The utilization of a qualitative data analysis tool allowed for easily storing, organizing and analysing data. In addition to the data analysis of qualitative data, quantitative data gathered from the evaluation form was also included? Quantitative data gathered in the study was imported, organized and analysed through Microsoft Excel.

RESULTS

For mobile apps used in Physics education, teachers were asked to share for which purposes they integrated mobile apps into education and, they were asked to explain what affordances mobile apps had in the Physics subject context. Teachers generally used apps for content presentation, assessment, communication and sharing, measurement. Affordances of mobile apps for the Physics subject context were explained in terms of authenticity and personalization.

DISCUSSION

How do Physics teachers use mobile apps in education? For mobile apps used, the teachers were asked to describe how integrated mobile apps into education and which affordances they thought mobile apps had within the Physics subject context. Teachers were asked to explain what kind of mobile apps were used and for which purposes (communication, interaction, content presentation, sharing, collaboration, etc.). For example, for students to develop content or educational products, teachers preferred apps such as App Inventor, Scratch & Arduino. The number of participants: 1547 students and 67 physics teachers. Almost all the teachers (n=64) agreed that mobile app integration into Physics subject activities could promote personalization that meant students could reach content with ease, they could perform autonomous learning, making research, calculations or measurements during activities and they could continue learning without time or place constrictions spending less time.

CONCLUSION

Mobile apps are constantly and rapidly evolving, and there is practically no social domain where they would not be used, including education. The use of different mobile apps resources offers a lot of possibilities:

- organizing an interactive learning process;
- demonstrating and simulating physical processes;
- providing access to a wide variety of resources;
- processing the data – both for calculations, for the visualization of results and for modelling processes.

When deciding to use mobile technologies in the physics learning process, the teacher should be sure that this is the most effective tool in the situation.

KEYWORDS

Mobile apps, physics education process, skills

The Use of Airflow Tests and Anthropological Measurements in Assessing the Voice Range of Professional Singers

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INTRODUCTION

In the vocal arts, it is difficult to determine the exact type of human voice, and it is particularly challenging to identify the voice category of vocalist-beginners because the diapason of the voice has not fully developed. A vocalist often develops his or her voice in an unsuitable tessitura (sings in a wrong voice type) resulting in a loss of sound quality and damage to the voice. An objective metric-based system for the determination of the human voice is needed.

The detection for the correlation between the airflow and vital capacity of the lungs, anthropometric data of the singers and the type of the human voice.

MATERIALS AND METHODS

Sixty vocalists (ten sopranos, ten mezzo-sopranos, ten altos, ten tenors, ten baritones, and ten basses) were examined during this experimental research. All participants were professional singers who have been very successful singing in their voice category for more than five years. The Jaeger spirograph was used to investigate the volume of the peak expiratory flow of representatives of various voice categories, i.e. by measuring the speed of airflow in a time unit (per second). Measurements were made of height, body weight, vital lung capacity, and volume of the air flow per second in the big, middle and small bronchial tubes.

To analyse the results, leading indicators of descriptive statistics were calculated, and one-factor disperses analysis (ANOVA) was used in equivalence testing calculations of the average values of morphological qualities. All statistical calculations were performed with the "Statistics" programme (7.0 edition).

RESULTS

The average height of the vocalists: sopranos – 165,8; mezzo-sopranos – 168,1; altos – 175,8; tenors – 180,5; baritones – 187,5; basses – 188,2.
The average weight of the singers (kg): sopranos – 60,2; mezzo-sopranos – 70,5; altos – 74,1; tenors - 87,7; baritones – 91,4; basses – 92,6.
The average vital lung capacity of the singers (L): sopranos – 3,79; mezzo-sopranos – 3,96; altos – 4,35; tenors 5,13; baritones – 6,06; basses – 6,12.
The average peak expiratory flow of the singers per second (L/s): sopranos – 7,44; mezzo-sopranos – 7,43; altos – 8,19; tenors – 9,80; baritones - 11,49; basses – 11,2.
The average volume of the air flow per second in the big bronchial tubes of the singers(L/s): sopranos – 6,49; mezzo-sopranos – 9,29; altos – 7,42; tenors – 7,91; baritones – 10,07; basses – 9,77.
The average volume of the air flow per second in the middle bronchial tubes of the singers (L/s): sopranos – 4,60; mezzo-sopranos – 4,02; altos – 4,96; tenors 4,46; baritones – 5,79; basses – 5,73.
The average volume of the air flow per second in the small bronchial tubes of the singers (L/s): sopranos – 1,98; mezzo-soprano – 1,49; altos – 1,99; tenors – 1,69; baritones – 2,24; basses – 2,17.
There was a correlation between the airflow results e.a. Vital capacity, MEF 75 MEF 50 and PEF and the type of human voice, but there was no correlation between PEF 25 and the type of human voice.
There was a positive correlation between anthropometric data like weight and height and the pitch of the voice.

CONCLUSION

There is a correlation between the type of human voice and a person's height, weight as well as their vital lung capacity and peak expiratory flow. According to our research data, an algorithm could be made for the determination of the type of human voice to avoid voice damage and health problems related to the forced use of the voice in a wrong pitch.

KEYWORDS

Voice type, airflow test, anthropological measurements

Simple data approximation for computer and controller-aided devices

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INTRODUCTION

Development of mechatronic systems involves finding an optimal balance between the basic mechanical structure, sensor and actuator implementation, automatic information processing and overall control. Mechatronic systems are characterized by a combination of basic mechanical devices with a processing unit monitoring and controlling it via number of actuators and sensors. Therefore sensors are significant in the process of providing usable output to microcontrollers. Wide range of sensors are available for constructing mechatronic systems. Sensors can be divided into two big groups: Active and Passive. Other type of classification is by the means of detection used in the sensor. Some of the means are electric, chemical, radioactive etc. Various types of sensors are classified by their measuring objectives for example light sensors, temperature sensors, flow sensors etc.

MATERIALS AND METHODS

In the process of constructing a mechatronic system a proper setup and signal processing must be provided. There exist certain problems with several sensors, therefore sometimes additional circuits for signal conditioning are made to linearize the output with hardware, but some researchers and developers try to linearize the signal using software.

In modern manufacturing equipment very complex systems of devices and sensors are made therefore, they must function correctly because they are the main control parameters. It is particularly important that such control parameters that bring about a correct actual behavior in relation to the reference behavior of such a system are available as a function of time. This means that the parameters must be such that the actual behavior of the system corresponds as closely as possible to the reference behavior. Some examples of such systems are:

- Robot arms, which move a tool, such as a laser or burr removing tool, for example, which is to be guided along a particulary contour line of a workpiece.
- Heating systems which are intended to impart a particulary temperature profile to a workpiece.

The input data of sensors is crucial for mechatronic systems.

A large part of the system is equipped with sensors that read the most important parameters – location coordinates, altitude, compass readings, distance to the barrier (for robots and unmanned aerial vehicles), temperature (heaters and coolers), lighting, etc.

Often, some types of sensors give floating data, processing which, a computer or controller acting under an algorithm develops non-physical, inexecutable commands for the final control elements. This results in an increasing load of engines, heating elements, and other actuators, as well as inappropriately increasing energy consumption.

The well-known PID algorithm and numerical approximation with built-in MatLab or MATCAD functions does not provide a solution for autonomous systems with controllers that have limited memory and speed of operation.

RESULTS

New methods that approximate sensor data and are applicable to both analogue and PWM (Pulse-Width-Modulation)-controlled devices have been developed in the paper.

The first proposed – derivative - method relates to the restriction of the function direction coefficient module. The second method – the growth bisection method enables smooth sensor data to be obtained.

The derivation method is based on limitation of the maximum function increment to a specified level. The growth bisection (proportional) method is based on comparison of the increment module with the increment in the previous step and its proportional decrease by multiplying by a predefined constant. Both methods take up some lines in the control program code, and most mechatronic equipment is capable of real-time operation.

CONCLUSIO

Dynamic data background connection allows to obtain a self-learning system adapting to the nature of incoming data – a higher number of data will be used in case of minor changes; in contrast, only the last data saved will be used for a rapid change. A system response delay is negligible.

KEYWORDS

Data, approximation, algorithm, controller-aided systems

Virtual laboratories in science and engineering

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INTRODUCTION

Virtual laboratories have been used for several decades as a tool to help in the educational process. However, it is not always clear the purpose and correct way to use this tool. Educators need to improve their work so that the teaching process is more efficient. A wide range of virtual resources is available in different languages. Most of the resources are in English and some in Latvian, therefore the use of virtual laboratories is made very simple.

Hypothesis: The efficient use of a virtual laboratory depends on multiple circumstances.

The concept of the virtual laboratory is understood and used differently by many authors and researchers because that depends on the purpose of use. In the most general terms, a virtual laboratory is a computer-based activity where students interact with an experimental apparatus or other activity via a computer interface. Typical examples is a simulation of an experiment, whereby a student interacts with programmed-in behaviours, and a remote-controlled experiment where a student interacts with real apparatus via a computer link.

This kind of process allows students to explore a topic by comparing and contrasting different scenarios, to pause and restart an application for reflection and note taking, to get practical experimentation experience over the Internet.

The most recognizable are computer simulations that allow us to examine basic concepts in physics. These simulations are broadly used in the teaching and learning process in different ways.

The purpose of this research is to study through virtual laboratories that are broadly used in educational institutions and to examine the usefulness and impact of using such laboratories.

MATERIAL AND METHODS

To find out the circumstances for the efficient use of a virtual laboratory, research has been made to understand the key factors.

A criterion for effectiveness of the virtual laboratory is made depending on other experiences over the past ten years.

Mostly through literature studies and depending on experience, all the assumptions are justified.

RESULTS

What people mean by a virtual laboratory, to understand what value it can bring, and importantly what it cannot and must not do. A virtual laboratory must bring as close a connection to reality as possible, to as many students as possible.

The key areas of benefit are accessibility, training and augmentation.

Nothing can replace the experience of working hands-on with laboratory equipment, the virtual laboratory should not be used to provide a full experience.

In some cases, learning a new environment or software for simulations can be difficult and time consuming.

In the context of geographical location or mobility issues, the use of a virtual laboratory may provide a substitution for a real experiment. A substitution is also necessary due to lack of equipment.

DISCUSSION

In recent years, researchers do not try to prove that virtual experiments are better than experiments in real life because such researches were made and the results in most cases do not prove that virtual experiments bring better results in students' exams.

Different researchers try to prove that using virtual environment in some cases changes the attitude towards physics and science.

In future authors will make and use virtual laboratory not only as computer simulations but also as a whole environment for learning and teaching physics and science.

CONCLUSION

The results are theoretical. However, this research is significant for future work because it helps to prevent failures and focus on things that have not been done before.

There exist some limitations due to a lack of students. Therefore, the authors can also focus on different stages of education.

KEY WORDS

Virtual laboratory, simulations, laboratory equipment

Energy wood stores in undergrowth of forests in Latvia

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INTRODUCTION

Forest resources are the most significant natural asset of the state of Latvia. According to data of the 2nd stage of forest resource monitoring for 2014, Latvia has 3575 thousand hectares of forest land comprising 55.3 percent of the total territory of Latvia, while the total timber stock is estimated at 668 million cubic meters (Bumanis et al., 2014).

However, from the available data on forest resources it is only possible to theoretically and hypothetically state what proportion of these resources would be useful and economically justified as an energy supply. Each forest stand has a certain amount of undergrowth and understorey – small woody plants (shrubs) which have not been researched much until now. A precise determination of the amount of energy wood in Latvian forests would be of great benefit to the Latvian economy.

MATERIAL AND METHODS

Research data were collected in forests at the Jelgava Forest District "Forest Research Station". The research was carried out in two forest subquarters of forest site type *Myrtillosa mel.* Eight circle-shaped sample plots were established. The area of each single plot was 25 m^2.

In the sample plots, the understorey and undergrowth trees were cut at the root neck. A sample was prepared from each tree harvested which was then sent for drying.

The wood samples were transferred to "Forest and wood products research and development institute Ltd" for moisture determination. Total moisture content of the wood sample was determined according to standard LVS EN ISO 18134-2: 2016.

RESULTS

In the forest subquarter with a stand composition of 10Pine (66 years old) the sum biomass of undergrowth and understorey was 177.91 kg per sample plot. In the forest subquarter with a stand composition of 9Pine1Birch (88 years old) there was a total understorey tree mass of 180.9 kg but 16.17 kg of undergrowth per plot. This means there was more biomass in understorey than undergrowth in the site investigated.

DISCUSSION

When the tree stand was 10Pine (66 years old) the amount of dry matter to be extracted from all sample plots was 12.37 t ha^{-1} on average. In the forest subquarter with a stand composition of 9Pine1Birch (88 years old) the amount of dry mass is 10.24 t ha^{-1} on average.

According to previous research, 7-20 t ha^{-1} of dry mass was obtained in Sweden, 7 to 12 t ha^{-1} in Poland, 6 to 14 t ha^{-1} in Germany and 8 to 12 t ha^{-1} in Latvia (Lazdina et al., 2010). There are also several researches papers which describe biomass from young hardwood stands on abandoned agricultural land in Canada: the values vary from 0,6 t ha^{-1} to 82,6 t ha^{-1} (Lupi et al., 2017). Consequently, a sufficient amount of biomass was obtained in the forest subquarters investigated in our research, which fits with the results of other studies carried out.

CONCLUSION

The volume of potential energy wood in undergrowth and understorey in *Myrtillosa mel*. forest site types is significant and it is advisable to use it as a raw material for energy production together with felling residues. However, it is necessary to evaluate the technical and technological capabilities from an economic perspective in each particular case.

KEYWORDS

Energy wood, biomass, undergrowth, Myrtillosa mel. forest site type

The impact of using technology-based communication on the quality of work relationships

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INTRODUCTION

The use of modern technologies has changed the work setting and this change offers us many advantages and benefits. Technology based communication allows us to span time and distance among people. Technology development is moving at such speed that social human behaviour science has not kept pace. There is enormous research on human behaviour, but we lack new models for guiding managerial practices. The question is how to have highly performing, motivated and satisfied employees within companies, where communication is fully or partly technology based.

MATERIALS AND METHODS

The current article has described the relevant literature pointing out the most important theories and influencing aspects of the presented contextual model. The conceptual model, developed by the authors, shows that the relationship between a technology-based communication work setting and the quality of relationships is moderated by culture and the development of social relationships among employees.

RESULTS

From the presented literature review it can be concluded that technology-based communication (the amount of technology used) affects the quality of work relationships, which is mediated by culture and can be influenced by face-to-face events and norms. The more work communication is done through technology-based means, the harder it is to maintain high quality relationships inside the company.

Communication via technology has a negative effect mainly because of misunderstandings and anonymity. Considering cultural differences and implementing suggestions for the development of social relationships, the quality of relationships can be improved.

DISCUSSION

First of all, the cultural differences have to be taken into account, especially in a multicultural context. Low Context culture members tend to be more specific and clear with their messages, while High Context culture members tend to have hidden context and messages that are not so clear, because of missing context that is rooted in the past.

Another mediator that can improve the quality of relationships is development of social relationships.

For further research the authors recognize the importance of leadership as the most important role in maintaining good quality relationships within the company.

In future research this model should be continued by investigating the technology-based communications' effect on work motivation and work satisfaction. The quality of work relationships are expected to have an influence on employee satisfaction and this idea could be discussed in order to extend the current model.

CONCLUSION

The connection of these variables is clear and the more that communication in the company is through technology-based means, the less is the quality of relationships among members. There are several suggestions for improving these relationships.

In this article, the lack of concentration on human behaviour science in Computer Supported Cooperative Work is recognized. The future competitive advantage will be a motivated work force in combination with advanced technologies.

KEYWORDS

Technology-based communication, work relationships, high-context and low-context culture, computer supported cooperative work.

Towards a New Digital Game of Contemporary Aesthetics

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INTRODUCTION

This paper partly envisages the research results of the European Regional Development Fund (ERDF) project (see Acknowledgements). The task is to create an innovative digital game in the cross-cutting genres of art game and educational game. The game presents the specific aspects of digital art games and their historical background. Work on the new game will be carried out in a collaboration of the researcher, Dr.art. Ieva Gintere (Vidzeme University of Applied Sciences, Latvia) and the game artist, Mag.art. Kristaps Biters (Latvia). The game is being created in the framework of a Post-doctoral project led by Ieva Gintere during 2018-2021.

MATERIALS AND METHODS

Unity3d for game design. Blender 3d object design. Audacity and Abletone music generation and editing. Photoshop, illustrator for game texture, art design.

RESULTS

The study presents an insight into contemporary digital game theory and a new threefold method of game creation named RKTR (research / knowledge transfer / research). In this model, the game is created on the basis of research and knowledge transfer: knowledge gained in the research process is transferred to the players. The game also functions as a platform of new knowledge construction as the secondary task of the game is to collect the results of the players in order to analyse the new creative tendencies and to foresee the art trends of tomorrow.

The proposed method focused on the aspect of knowledge transfer is constructed as a three-level spiral:

- research-based game creation (the game is based on the results of research),
- knowledge transfer (the game transfers the research results to the player),
- use of the gameplay results in research (the game creators collect the data of the gameplay for new research).

The existing game designers and theoreticians carry out research in action where the game design is united with the game research. In the discourse of digital gaming, this is a widespread method. However, there is a missing part in this model. Knowledge gained in this type of research does not flow beyond the circle of the game's creators and researchers. This knowledge stays within the society of the game's designers and researchers, and functions as a tool for their future work. Knowledge is an instrument for experts, and it is not transferred to the regular player. The existing model of a research-based game helps to obtain formal and professional knowledge: it is a know-how, it tells a designer how to build a game, but it is not meant for the player. The aim of the new digital game that is being created in this project, is to connect the research results with the player so that the knowledge acquired in the research process is effectively transferred to the general public.

DISCUSSION

Taking into account that art today is largely interactive, the new art game will let its user play with trends of digital art such as noise, generative art and others, and to create new ones. The aim of this project is to raise the interest of a wide-ranging public for contemporary art and to point out the newest creative tendencies in art. The game would develop the creative skills of players and teach them the current trends in digital art. At the same time the game would project the inheritance of art from the age of modernism into the digital world by teaching the player to recognize it (for instance, generative art is a successor to the Fluxus movement in modernism). The new art game is intended to educate the player and to stimulate his/her creative forces.

The Design Science Research method is being used in this study in order to cross-cut such remote fields as the general public, the arthouse world, codes of modern art and the tastes of the general public. The Design Science Research method helps boost efficiency and interest towards contemporary art games. It intends to integrate seemingly distant disciplines and seeks parallels in different areas in order to gain new knowledge and adapt fresh approaches. By finding common aspects in different areas, Design Science Research fuses areas and invites new trends into a research field.

ACKNOWLEDGEMENTS

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KEYWORDS

Digital art game, methodology of digital games, knowledge transfer, aesthetics of modernism.

The Challenges facing Smart Technology Use in the Implementation of Electronic Education and Export Education

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INTRODUCTION

There are several socio-political challenges facing the choice of multi-media and ICT use for the implementation and acceptance of electronic education and export education (e-education) as new smart technologies are applied to the teaching-learning process of higher education (HE) institutions. As a result of a proliferation of smart technologies use in this domain, there is a need for smart educational institutions to export education through electronic education across their international boundaries and for them to assess the socio-political problems facing this form of digital education.
This study will examine and identify the socio-political challenge facing smart technology use in e-education through electronic education across international boundaries.
This is important as HE institutions have witnessed a growth of technological expansion and uses as helpful means to increase the effectiveness and efficiency of digital education and the changed academic lives and perspectives of digital world.
It will support and suggest improvements to the continuous development of ICT use for e-education that will result in an efficient and cost effective means of teaching-learning in HE institutions.

HYPOTHESES

- How does the socio-culture attitude and political policies affect the expansion and multi-media technology uses for e-education and electronic education in HE institutions?
- How do we promote this continuous expansion and multi-media technology use in digital education through a transformation of users' socio-cultural attitude and political policies affecting its effectiveness and efficiency?

H1 – Users' socio-cultural attitude and government-political policies have considerable effects on the expansion and multi-media technologies' uses for e-education through electronic education.
H2 – Users' socio-cultural attitudes can be modified and improved towards more effective and efficient digital education for e-education in HE institutions.

LITERATURE REVIEW

The essence of this research study is based on the derived assumptions that:

- Multi-media technologies' use in web-based learning environments are carried out within the influence of societal culture and cultural adaptation in creating successful ICT tools for use in digital education.
- Uses of web-based learning environments are carried out within the influence of social culture and learners' learning culture (Senouci et al 2015; Ogunbase, A. 2016; Ogunbase, A. & Raisamo, R. 2017).

These researches highlighted the techniques that were expected to be relatively easy to use and could be adopted by many students and teachers. These techniques include an elaborative learning culture, learning styles and acceptability designs for digital education.
This new study will focus on previous studies' results/findings and examine/identify expected new results of users' socio-cultural attitude and political policies affecting effective and efficient technology use for e-education.

METHODOLOGY

Mixed-methods methodology will be used that will involve a questionnaire and interview questions. In analysing the data collected, relevant statistical techniques will be adopted to report results.

RESULTS

It is expected that this study will get to the extent at which socio-cultural attitude and political policies affect the expansion and multi-media technologies' use for e-education in HE institutions which will help learning management systems, researchers and education actors in using new smart technologies in the teaching-learning process of HE institutions.

KEYWORDS

Smart technology, electronic education, export education

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The Effect of Early Childhood Education and Care Services in Latvia

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INTRODUCTION

In recent years, more attention has been paid to social investment policies, especially the importance of investment in early childhood. A growing number of studies have shown that social investment at an early age has the highest returns in human capital and the main social investment instrument in this period of life is high-quality early childhood education and care services (hereafter – ECEC services). The importance of social investment in early childhood has been stressed in both Latvian and EU planning documents. One of the policy priorities defined by both the EC and the EP in order to meet the Europe2020 targets is to "ensure universal provision of ECEC".

Previous research has shown that the successful implementation of social investment at an early age reduces crime, increases the future number of school graduates and skilled workers, and also brings individual benefits - better health, greater civil and social involvement. However, since most of these studies have been conducted in the US there is a lack of empirical research on social investment returns in Europe, and in Latvia,. Until now, social investment returns have not been researched in Latvia.

The aim of this research is to see if early signs of positive change as a result of social investment can be observed, given that statistical data shows an expansion of ECEC in recent years in Latvia, especially for children who have not yet started compulsory education. The ECEC attendance rate has grown from 44.42% in 2010 to 54.43% in 2017.

MATERIALS AND METHODS

In this the study the author has analysed whether or not positive connections can be observed between ECEC attendance rate and eight indicators that have been positively connected with ECEC attendance rate in previous studies - educational attainments (3rd grade test results), school graduation rate, average income, teen pregnancy rate, fertility rate, female workforce participation rate, overall labour-force participation rate and crime rate.

To achieve the aims of the study, analyses of policy documents, previous research and statistical data were carried out. SPSS Software was used for data editing and analysis. Statistical data were analysed from the period 2010-2017, with exceptions in the case of high school graduation rate (2011-2017) and educational attainment (2012-2017) due to the lack of open access data available on these topics. To gain a deeper understanding of the research results that are connected with educational outcomes, 14 secondary school teachers from two schools in Valmiera were surveyed.

RESULTS

Research results show that in recent years a positive connection can be observed in Latvia between the ECEC attendance rate and fertility rate (0.879), female employment (0.981), overall employment (0.980), average income (0.955) and teen pregnancy (-0.967). Results show that ECEC services can be one of the factors that have positively influenced these indicators.

A weaker connection can be observed when we look at the high school graduation rate (0.703) and crime level reduction (-0.786). However, research results showed that there is no connection between ECEC attendance rate and educational attainment (average state examination results of 3rd graders in mathematics (-0.110) and learning language (0.111)).

CONCLUSION

There has been an increase in social investment in early age in Latvia, and it has already had some economic and socio-economic outcomes. However, despite the fact that literature suggests the effect of ECEC on educational attainment can be observed the earliest, results showed that this is not true in the case of Latvia. Surveys of 1st-grade teachers suggested that this kind of situation may occur due to ECEC quality problems, so further studies in this field should be carried out.

KEYWORDS

Child's development, early childhood education and care services, social investment return, women employment.

Deposit Refund System for Beverage Containers in Latvia: Learnings within the Baltic States

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INTRODUCTION

One of the main global environmental problems we are facing is the increasing the amount of waste. There are numerous policy instruments used to reduce the environmental impact of packaging. Many EU member states use producer levies, packaging and resource taxes, deposit-refund systems and producer responsibility systems (Bailey, 2017; Watkins et al., 2017).

MATERIALS AND METHODS

In this article we conduct comparative analyses and evaluate the effectiveness of deposit-refund systems for beverage packaging in the three Baltic States: Estonia, Latvia and Lithuania. Data used in the study is obtained from statistical databases of the Central Statistical Bureau, Eurostat and Euromonitor, as well as from stakeholders of the deposit-refund system - beverage manufacturers, retailers and waste management organisations. When necessary data was not available, we made calculations and approximations using analogies with neighbouring countries, e.g. regarding the quantity of different kinds of beverage containers (plastics, glass, cans) delivered to the market, the average weight of containers, changing trends etc.

RESULTS

To stimulate the rate of beverage packaging collection and recycling, both Estonia (2005) and Lithuania (2016) have introduced deposit-refund systems. Both are mandatory centralized systems with collection rates over 90%. The strengths of the Estonian system are a result of sophisticated IT solutions, differentiated EAN coding logic, elasticity and good management. The Lithuanian system is one of the most technologically advanced systems. One of its positive features is the lease of taromats, reducing the upfront investment costs for retailers and producers.

DISCUSSION

Previous research shows that the introduction of a deposit-refund system increases the collection rate of beverage packaging (Dewey, Denslow, Chavez, Romero, & Holt, 2011; Lavee, 2010) but requires substantial organisational and financial resources. It is more economically viable to introduce a deposit system when separate waste collection system is already in place. The results of this study are similar.

CONCLUSION

1. Latvia needs a DRS in order to achieve PET goals and reduce environmental pollution;
2. The required score and distribution is about the same
3. A DRS has to be operated by a non-profit organisation consisting of manufacturers and retailers;
4. The recommended deposit is 10 cents;
5. Provision should be made for the inclusion of beverage cartons and alcoholic beverage bottles;
6. Provision should be made for the inclusion of refillable glass bottles and jars.

KEYWORDS

Deposit-refund system, Baltic States, beverage packaging, waste management

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The Specification of Hydrological Model Requirements for Bog Restoration

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INTRODUCTION

Within the scope of biodiversity and sustainable ecosystem development, the restoration of a bog's ecosystem is important because by reducing the drainage effect on the bog, the negative impact on adjacent intact or relatively intact raised bog and other wetland hydrological regimes is lowered. Degraded bogs are mires with a disturbed natural hydrological regime, or those partly exploited for peat extraction. However, the hydrological regime can be restored and peat formation is expected within 30 years. The restoration of a bog's hydrological regime can be accelerated by filling up the drainage ditches.

In the course of researching scientific literature, the author has found no evidence of a system dynamics model developed to simulate tree cutting intensity in degraded bogs after filling the drainage ditches for the purpose of speeding up the restoration of the hydrological regime. Thus, this approach is an innovative way of solving the problem.

Bog hydrological systems are complex systems with many components, thus an interdisciplinary approach must be applied which combines hydrology, biology, geography and meteorology with computer sciences. Specification requirement technique is a useful tool for determining the elements that shape a bog's hydrological system and interact with each other, thus providing the design for a simulation model.

MATERIAL AND METHODS

In the opinion of the author, the most suitable specification requirement tool to determine components forming the bog hydrological system is (OOAD), because it is applicable both in system dynamics and object modelling systems. Based on OOAD, it will be able to build system dynamics models in STELLA system dynamics and the GEOframe NewAGE modelling system, which is based on an object modelling system framework.

OOAD principles are fundamentally based on real world objects (Powell-Morse, 2017) - in this case, the elements forming a bog's hydrological system.

OOAD combines all behaviours, characteristics and states into one analysis process, rather than splitting them up into separate stages, as many other methodologies would do (Powell-Morse, 2017).

OOAD can be divided in two parts – Object-Oriented Analysis (OOA), and Object-Oriented Design (OOD). The products of OOA serve as models from which we may start an object-oriented design; the products of OOD can then be used as blueprints for completely implementing a system using object-oriented programming methods (Booch, 1998).

In the study of the boundaries of the bog hydrological model, theoretical methods such as case study and content analysis were mainly used - specifically evaluative, explorative and instrumental review methods.

RESULTS

This study helped to understand complex interrelationships that exist between different elements within a bog's hydrological system. The bog hydrological system boundaries were clarified, and the simulation model specification requirements were determined.

DISCUSSION

The next step is to develop simulation models in STELLA system dynamics and the GEOframe NewAGE modelling system and compare the performance.

These simulation models will be made to represent water movement in a bog's hydrological system from water input by means of precipitation to water output through interception, sublimation, evaporation, transpiration, lake outflow and overland flow.

The input data will be loaded manually from the QGIS Open Source Geographic Information System and Excel databases. It will be possible to generate output data in the form of frequency tables, graphical analysis, review tables, GIS raster files and others.

CONCLUSION

The determination of tree thinning intensity in degraded bogs using modelling is a new innovative approach which should allow the water level of ecosystems to be restored faster and more efficiently, thus increasing natural diversity, improving the quality of life of local people and promoting bog recreational ability.

KEYWORDS

Requirement specification, imitation modelling, bog restoration.

Talent retention, attraction and the required future skills for employees in winning cities in rural regions

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INTRODUCTION

The article intends to identify the factors that can retain talented people and attract new talent in small and medium-sized urban areas of European scale, especially in regions with declining and ageing populations. The problem is topical in today's Europe and as well as in Japan. It is equally important to understand the skills needed and the sectors where talents are required in small and medium-sized urban areas with an ascending development trend.

The theoretical background of the research is based on literature studies on the theory of talent flow, knowing the factors of the talent flow in small and medium-sized cities, and building the talent flow models based on them. The article discusses the concept of talent (Michaels et al. 2001, several dictionaries, understanding of Valmiera residents). The researchers define that talented people fascinate others, create and implement ideas and have good reasoning skills. Until now, mainly in Europe and in the USA, the attraction of talent at the level of cities and regions has been implemented through migration policy. The administrative boundaries where the migrant talents come from are not as important as the factors that encourage the decisions on the choice of the place of living and work.

In Estonia a National Policy for Attracting and Retaining International Talents (2014) has been developed. The findings of the report on models for attracting talent in Europe through the public sector are relevant to small and medium-sized urban areas.

In the case study, there are no respondents representing a migrant group that is not a diaspora, and this is a specific feature of a small and medium-sized urban area.

MATERIALS AND METHODS

The empirical part has been developed through a study in Valmiera City (Latvia, Europe) with a population of 23 thousand inhabitants, aiming at increasing this number by 5000 and further boosting growth in the city's competitiveness in human resources. A survey of 25 experts was conducted initially to highlight the trends. In order to obtain the data, 29 interviews were conducted with the city's entrants, outgoing residents and the steady, already stable and welcoming residents of Valmiera. Also, an online survey of 81 university graduates was carried out to find out the major reasons for staying in or leaving the regional city of Valmiera.

The research city of Valmiera was compared to Ventspils, Rezekne and Jelgava in Latvia, as well as to two foreign cities in Northern Europe – the nearest neighbouring city of Tartu in Estonia and Joensuu in Finland. The cities were compared by socio-economic factors - population dynamics, economic development, access to culture, and political stability, which are important factors in attracting talent.

> The research methodology is based on the theoretical findings of Ingram, Shapiro, Albouy on the impact of four dimensions in talent attraction: economic development, market competition, labour market conditions and national culture, as well as the impact of lifestyle on choice. According to these dimensions, interview questions have been developed, and, by grouping the content, the analysis of the responses has been carried out.

The previous study by the authors has been used as a secondary source. The study focused on the future skills needed for the labour force in the Vidzeme region in Latvia, and the compliance of the proposed education with the labour market requirements in the Vidzeme region of Latvia.

RESULTS

The results of the research show that a job offer providing the applicant the possibility to demonstrate his capacity and pursue his or her objectives is of primary importance for the recruitment of skilled labour in a winning city in a rural area, followed by the appropriate housing and transport, and social infrastructure. As a secondary factor, lifestyle, which includes diversity, cultural environment, architecture and the presence of the natural environment, is important. The importance of the factors of attraction varies according to the stage of human life.

DISCUSSION

The results of the interviews show that small and medium-sized urban areas have the potential to attract talented human resources, taking into account the key attraction factors described in the theory.

The empirical analysis in the example of Valmiera reveals that a significant attraction factor in small and medium urban areas is social ties with the area. The labour market demand is also an important factor.

The results of the research revealed that in certain occupational groups in Valmiera (such as managers, social sciences in general), the labour market demand is lower than the supply.

In further research it would be necessary to carry out focus group interviews with migrants in small and medium-sized urban areas in order to find out the important factors in taking a decision on their choice of residence.

CONCLUSION

Small and medium-sized urban areas need to develop diversity and openness. This initiative needs to be strengthened both in the operation and investments of a municipality and in communication with the public. Virtually all of the examples discussed refer to migration as inevitable in attracting talent – highly skilled people.

KEYWORDS

Talent attraction, winning cities, small and medium urban area, future skills, focus

A Web-based fast and reliable text classification tool

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INTRODUCTION

Opinion analysis in the big data analysis context has been a hot topic in science and the business world recently. Social media has become a key data source for opinions generating a large amount of data every day providing content for further analysis.

In the Big data age, unstructured data classification is one of the key tools for fast and reliable content analysis. I expect significant growth in the demand for content classification services in the nearest future.

There are many online text classification tools available providing limited functionality -such as automated text classification in predefined categories and sentiment analysis based on a pre-trained machine learning algorithm. The limited functionality does not provide tools such as data mining support and/or a machine learning algorithm training interface.

There are a limited number of tools available providing the whole sets of tools required for text classification, i.e. this includes all the steps starting from data mining till building a machine learning algorithm and applying it to a data stream from a social network source. My goal is to create a tool able to generate a classified text stream directly from social media with a user friendly set-up interface.

METHODS AND MATERIALS

The text classification tool will have a core based modular structure (each module providing certain functionality) so the system can be scaled in terms of technology and functionality.

The tool will be built on open source libraries and programming languages running on a Linux OS based server. The tool will be based on three key components: frontend, backend and data storage as described below:

- backend: Python and Nodejs programming language with machine learning and text filtering libraries: TensorFlow, and Keras,
- for data storage Mysql 5.7/8 will be used,
- frontend will be based on web technologies built using PHP and Javascript.

EXPECTED RESULTS

The expected result of my work is a web-based text classification tool for opinion analysis using data streams from social media. The tool will provide a user friendly interface for data collection, algorithm selection, machine learning algorithm setup and training.

Multiple text classification algorithms will be available as listed below:

- Linear SVM
- Random Forest
- Multinomial Naive Bayes
- Bernoulli Naive Bayes
- Ridge Regressio
- Perceptron
- Passive Aggressive Classifier
- Deep machine learning algorithm.

System users will be able to identify the most effective algorithm for their text classification task and compare them based on their accuracy.

The architecture of the text classification tool will be based on a frontend interface and backend services. The frontend interface will provide all the tools the system user will be interacting with the system. This includes setting up data collection streams from multiple social networks and allocating them to pre-specified channels based on keywords.

Data from each channel can be classified and assigned to a pre-defined cluster. The tool will provide a training interface for machine learning algorithms.

This text classification tool is currently in active development for a client with planned testing and implementation in April 2019.

KEY WORDS

Text analysis, machine learning, deep learning, text classification, social media analytics

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