Developing E-learning course "Circular Economy" in the Study process and Adult Education

Dzintra Atstāja[1,2*], *Māris* Purviņš[2], *Jānis* Butkevičs[2], *Inga* Uvarova[2,3], and *Natālija* Cudečka-Puriņa [2]

[1] Rīgas Stradiņš university, LV-1007 Rīga, Latvia
[2] BA School of Business and Finance, LV-1013 Rīga, Latvia
[3] ArtSmart Ltd. , LV-1082 Rīga, Latvia

Abstract. The educational process has changed; many more technologies and solutions are involved in preparing the subject and the study process. A degree of maturity in using digital tools has been reached, allowing the student to learn the subject whenever and wherever he or she wishes. The experience gained in the USA shows that in the case of successful development of an asynchronous course, in combination with really extended feedback, even content-compliant courses can be acquired in this way very successfully. The purpose of the article is to show a success story of developing a modern e-learning course, modernizing and digitizing their study courses. A complete cycle of "learn by doing" and "do by learning" approaches are being implemented for the first time. By support Erasmus+ project is developing an innovative, asynchronous online course on the topic of Circular Economy and will to improve teachers' digital pedagogical competencies by enabling them to provide a high-quality learning process. At all levels of education, it is essential to keep up with the requirements of the 21st Century and opportunities, to change previous thinking and accept digitization is the duty, mission and task of every teacher, student and administrator.

1 Introduction

Education keeps pace with technological achievements and encourages people to be aware of and take responsibility for their lives and for the society in which he lives, to understand local problems in a global context, and to understand and respect the different ones. Adult education policy in Latvia is closely linked to almost any area relevant to the country's development, but most closely with the economy, business, and employment. Digital and increasing study in a virtual environment are changing the attitudes of students to study [1-6].

The digitisation of study courses should be continued through learning technologies. Through the development of interactive testing works (tests) and teaching materials recorded

* Corresponding author: dzintra.atstaja@ba.lv

in the study (high-quality audio-visual design), academic staff should use digitised gambling techniques to prepare courses teachers to learn to develop competencies.

The purpose of this article is to present a success story and to share the experience of teaching higher education teachers to develop a modern e-learning course with new adventure and knowledge, modernising and digitising their study courses.

The COVID-19 pandemic has not only limited how people can relate to each other and perform their most basic every-day-tasks but also has a significant impact on the regular delivery of higher education. The current COVID-19 crisis has dramatically accelerated the need for modernization and digital transformation of education systems across Europe. As a recent European University Association (EUA) study indicates there have never been so many students and staff exposed to online learning and teaching as it was since March 2020. This crisis can become a historic opportunity to make a significant leap in digital education take-up. The goal is to reinforce the ability of educational institutions to provide high quality, inclusive digital education. Briefing of EUA also emphasized that the crisis aggravated the digital gap, as not all students can access technology and high-speed internet. At such a critical time for us societies, access to education is proving, more than ever, to be essential to ensuring a swift recovery while promoting equal opportunities among people of all backgrounds. With the immediate crisis and lockdowns, universities shifted towards online lecturing platforms (e.g., Zoom and similar). Still, they require students to have high-speed internet connections and separate (private) rooms with defined schedules of lectures. These are typical disadvantages of symmetric online learning. Thus, to make higher education more affordable, it should be more shifted to distance online learning (asymmetric learning) or blended methods (a mix of symmetric and asynchronous teaching). Another challenge that comes from the current crisis is that the industry should also focus on the development of digital pedagogical competencies of educators, enabling them to deliver high quality interactive digital education, and to develop high-quality digital content. The study content must be modern, and research based. [7-8]

Nobre & Tavares (2021) have defined "circular economy" (CE) as "an economic system that targets zero waste and pollution throughout materials lifecycles, from environment extraction to industrial transformation, and to final consumers, applying to all involved ecosystems. Upon its lifetime end, materials return to either an industrial process or, in case of a treated organic residual, safely back to the environment as in a natural regenerating cycle. [9] It operates creating value at the macro, meso and micro levels and exploits to the fullest the sustainability nested concept. Used energy sources are clean and renewable. Resources use and consumption are efficient. Government agencies and responsible consumers play an active role ensuring correct system long-term operation." Considering the different aspects of the economics covered by the definition and accordingly the variety of stakeholders involved, there is no doubt that the transition to a CE will affect and is already affecting labor market by creating new jobs and by requiring new skills and competencies both for employers and employees. Burger et al. noted that jobs that contribute to the CE are emerging not only in core CE sectors [10] but also in non-green sectors that support core CE sectors providing them with goods and services [11]

Higher education institutions play a critical role through teaching activities to provide the knowledge necessary for CE transition and to reskill professionals according to the new requirements of a CE. Recent lockdowns due to COVID-19 crisis demonstrated shift of higher education institutions towards the online lecturing platforms (e.g. Zoom and similar). Disadvantages of symmetric online learning requiring from students high-speed internet connections and separate (private) rooms at defined schedules of lectures called the higher education institutions to search for different solutions such as distance online learning (asynchronous learning) or blended methods (mix of symmetric and asynchronous teaching).

Project "Inclusive Digital Education - a Tool to Understand Circular Economy" aims to improve the skills and competencies of students via asynchronous online teaching method. The asynchronous method was selected considering the inclusivity aspect i.e. to grant access to the course for students who do not have settled access to high-speed internet and/or

designated private room for a specific time to take the course by promoting equal opportunities among people of all backgrounds. Access to the course irrespective to the time zones and opportunity to choose the most appropriate pace of learning and for review of suggested materials also served as arguments for the method design of the project. This issue can be of extreme importance to ensure inclusivity by allowing different types of students including persons experiencing some form of disability to participate with the course. However, the design of the course provides opportunity to integrate DiGiTOOL to CE modules also into existing study courses, for example, "Consumption" module into a regular study course "Marketing" in higher education institutions. [12]

2 Method

This article shows an actual work process that is being tested in a research group.
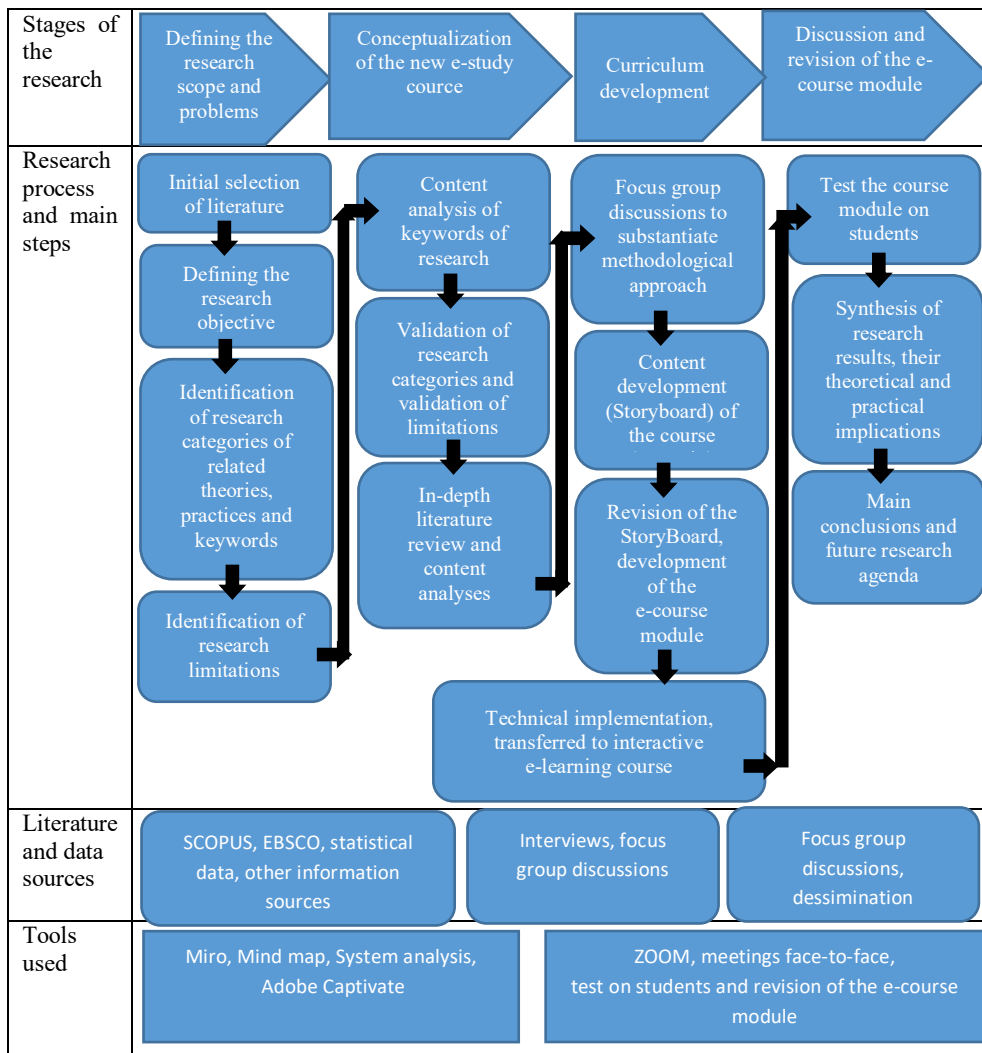

Fig.1. E-learning course development, created by authors.

In order to develop a new content part of the study course, the results of the scientific literature review are gathered, and the world's situation is analyzed. Risks and areas are clarified to coordinate the study program with partners from several countries, according to the challenges of the rapid development of the transition and requirements in the business environment. The development of study content uses digital tools and requires appropriate skills and knowledge. The collaboration platform is a convenient way of communication, while face-to-face meetings are impossible due to the Covid 19 pandemic. The authors believe this experience can serve as a basis for future educational and research needs in adult education. Figure 1 allows you to trace the processes necessary for developing a new course - from finding relevant literature on the topic and agreeing on the content of the Syllabus to Curriculum development, materials development and course approval.

3 Findings and Discussion

3.1 Adult education in Latvia

Adult education is an educational process for the length of human life, based on changing needs to acquire knowledge, skills, and experience to raise or change their qualifications in line with the labor market's demands, interests, and needs. Lifelong learning combines non-formal learning experiences with formal education, developing natural gifts among new competencies. Adult education is becoming more popular and allows changing study methods to achieve the best result.

The objectives of adult education are [13]:

- ensuring access to lifelong learning for citizens, regardless of their age, gender, previous education, place of life, income level, ethnicity, and functional disorders.
- develop an offer of high-quality education for adults, which provides sustainable skills for work, civil participation, and personality growth and contributes to developing a highly skilled competitive knowledge economy and a democratic society in Latvia.
- establish a harmonized regulatory framework and efficient management of resources (including financial), considering the principles of shared responsibility and interaction between sectoral policies, for developing a single lifelong learning system.
- The provision of skills takes place throughout life in informal (informal learning) and informal (e.g., mother tongue, learning skills), as well as through the involvement of a person in initial formal education (pre-primary, primary, secondary, tertiary) and non-formal education (additional training in programmes offered by different public, local and private education institutions, e.g. courses).

Formal and non-formal education is provided to people throughout their lives. Adult education is not linked to a particular age stage but with a human motivation to return to the education process after completing or leaving initial education to acquire new or further existing knowledge, skills and competencies (including attitudes) for competitiveness in the labor market and/or self-development.

3.2 Buffalo Program Characteristics

Riga Technical University (RTU) and the Ministry of Education and Science of Latvia have agreed on the use of state budget funds allocated to the Institute of Riga Technical University Riga Business School for the creation of an innovative study program in the field of information and communication technologies, Academic and scientific staff of Latvian universities and scientific institutions international training for the acquisition of high-level digital skills and knowledge transfer within the framework of the RTU project "Support for

RTU international cooperation projects in research and innovation" (1.1.1.5/18/I/008), according to the Cabinet of Ministers' decision of 06.06.2017 regulations No. 315 "Activity program "Growth and employment" 1.1.1.5. the implementation rules of the first, second and third round of selection of project submissions of the event "Support for international cooperation projects in research and innovation". The trainees are Academic and scientific staff of the Latvian state higher education institutions, who, upon winning the competition, are granted funding for the purpose of increasing their qualifications - to improve their digital skills, improve the quality of teaching information and communication technologies, as well as to learn the latest methods in preparing and conducting the content of IT courses.

Riga Business School has cooperated with several US higher education institutions for many years. One of the universities with which successful cooperation has been established, not only in the field of student exchange but also in the field of exchange of experience of higher education teachers, is the New York State University at Buffalo. This year is already the fifth semester when Latvian higher education teachers and researchers assumed the role of students and embarked on a 4-month full-time study experience to improve their digital skills. It is a non-degree program implemented by the faculty development program to study the interdisciplinary computer science program "Computer Science and Organizational Technologies" in the University of Buffalo in New York. Within the program, emphasis is placed on the integration of digital content in various fields, thus providing teaching staff with the opportunity to learn the latest methods in the preparation and delivery of IT course content, skills in managing and supervising student projects, as well as research and interdisciplinary academic experience.

Within the program's framework, participants are provided with the opportunity to study at the New York State University at Buffalo to improve their qualifications and learn the content that Riga Technical University and the University of Buffalo have previously agreed upon in the cooperation agreement. The University of Buffalo was chosen for the project partnership because during 30 years of cooperation with Riga Business School, a common understanding of the importance of interdisciplinarity in higher education has been formed. The University of Buffalo is one of the most highly rated universities in the field of technology education in the United States. University at Buffalo offers Latvian higher education teachers and researchers' fresh impressions on the optimization and digitization of the education process. Although the courses to be studied include the development of pedagogical skills, the emphasis is placed on the development of digital skills, where it is offered to learn mathematical analysis, various programming languages, the use of artificial intelligence and machine learning.

Latvian higher education teaching staff (including researchers and professors) who have participated in this program and have already returned to Latvia highly value the acquired IT skills and recognize that they are already being used in the development of new course content and improvement of the study process. The trainers also realise that the integration of digital methods in the learning process has already become a daily routine, as the development of IT skills is an integral part of business and society.

3.3 Differences between US and LV studies

On the surface, the education systems of Latvia and the USA seem to have no significant differences - both countries have universities, facilities, and professors. But the most exciting thing starts when you delve into the details. In the beginning, we can look at the financial indicators. The budget of the University at Buffalo for the 2021/2022 academic year was $850 million and 32K students. At the same time, the budget for all higher education in Latvia was €497.9 million and 77K students.

So, one of the most important differences between these two education systems is the amount of funding and, therefore, the scale with which the learning process and activities outside the learning process are organized. But funding is not the only difference. The differences are also in essence itself. Examples include efforts to automate the learning process. And this is not to be understood as creating video courses. There is an emphasis on in-person classes in the US, but various automation tools are used to evaluate student work. At the same time, study course technical assistants are also widely used, and professors can focus only on the study course content and exam preparation. Since there are no plans to implement such a practice in Latvian universities, partial or complete digitization of study courses is helpful as a solution.

Assistants help with the organization of tests and carry out evaluation work. In Latvia, plagiarism is often discussed only in the context of final theses (bachelor's/master's and doctoral). In contrast, at the University at Buffalo, we learned that academic integrity is integral to the daily learning process. Writing reflections is also popular in the US education system, which is not simply a retelling of the topic but is like synthesizing new experiences of students, which are not popular in the Latvian education system.

3.4 Why digital study courses are needed

Digitization in education simplifies organizational tasks. For example, electronic university learning platforms make it easier for students to report, outline and assess learning material. Today's university tools enable students to create individual study schedules and allow students to be mobile.

Digitization makes the study process more convenient and accessible for students. For example, hybrid studies, where some students are in the classroom with the instructor and some are connected remotely, allow students not to miss lectures when they cannot physically attend them. Mixed studies, in which digital technologies work together with the classical form of study, help to make the study process more individualized.

Table 1. The most common lessons learned by participants after studying in Buffalo, *created by authors.*

Fall	% of participants	Reflection
All (2019 -2022)	75	● The program educates Latvian teachers; similar experience would be useful elsewhere
2021, 2022	90	● Latvian students lack computer knowledge; this must be changed with the help of teaching staff
All	63	● The subjects and methods of the Buffalo program are a good example of how to teach in Latvia
All	70	● I will use my experience to improve educational programs in Latvia. It will help strengthen digital skills for students as well.

Table 1 summarizes the opinions of graduates of the Buffalo program. As mentioned earlier, the Buffalo training program for Latvian teachers is a specially designed exchange program. For the academic and scientific staff of Latvian universities and scientific institutions. These international studies are designed for the acquisition of high-level digital

skills and knowledge transfer. The survey results show that the acquired knowledge will be used in the study process.

3.5 Case study – development of the new E-learning study course

The experience described above is further used to prepare a new study course within the Erasmus + project. Project aims at (1) developing new competences for students in CE by inter alia encouraging environmentally friendly production, consumption and waste reduction, (2) developing digital skills for educators to engage in the further e-learning.

Project objectives are as follow:
1) to introduce the students with different aspects of circular economy via developed e-learning course "DiGiTOOL to CE",
2) to improve digital competencies of educators enabling them to deliver high quality inclusive digital education via developed e-learning course "DiGi Mentor".

Consortium of partner organizations was established to implement the project where higher education institutions and private companies are represented: 1) BA School of Business and Finance (Latvia), 2) Canadian Institute of Technology (Albania), 3) Fondazione Bruno Kessler (Italy), 4) ArtSmart (Latvia), 5) Entrepreneurship Institute – ENTRI (Lithuania), 6) Instituto Politecnico de Setubal (Portugal).

Direct target groups of the project are students of higher education institutions as well as educators of the higher education institutions of business, economy and finance fields.

3.6 Case study – development of the new E-learning study course

Literature defines production, distribution and consumption as the main economic activities to be addressed in the context of CE. Ellen MacArthur Foundation has defined three main principles of circular economy, driven by the design, namely: eliminate waste and pollution, circulate products and materials (at their highest value) and regenerate nature.

Course DigiTOOL to CE was developed to integrate in the course and to review in detail key CE economic activities and principles promoting sustainability and waste reduction. The course is composed of five modules as follow, see Figure 2:
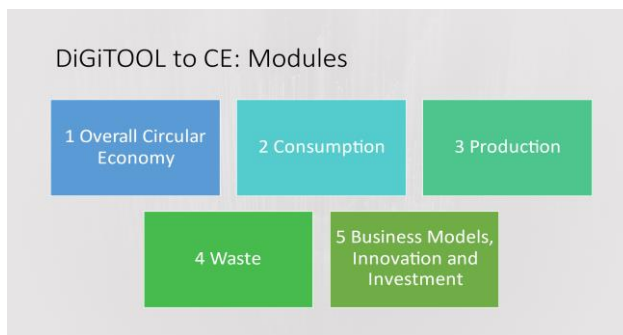
Fig. 2. DiGiTOOL to CE Modules, created by authors.

Literature on education for the CE offers a variety of theories of learning and teaching. [13] suggest the following core principles for CE teaching:
1. Interactivity. Such principle involves participatory teaching methods as allowing students helping different companies to increase the circularity of their business models.
2. Non-dogmatism. Requires to introduce both the strengths and challenges of the CE concept to enable students to critically evaluate circular economy concept.
3. Reciprocity. Suggests continous incorporation of students feedback into a course.

Course DiGiTOOL to CE comprises all the key principles of CE teaching as suggested in the literature. Since DiGiTOOL to CE modules provides integration opportunity into existing study courses, for example, "Consumption" module into a study course "Marketing" in higher education institutions, thus ensuring interactivity and reciprocity. Integration of non-dogmatism principle is ensured by highlighting existing challenges, for example, via "Marine pollution" discussion under "Waste" module, and calling students for a realistic view on problems and prospective solutions. Reciprocity will be ensured via piloting the course in partner higher education institutions and recommendations for the improvement will be considered following the approbation phase.
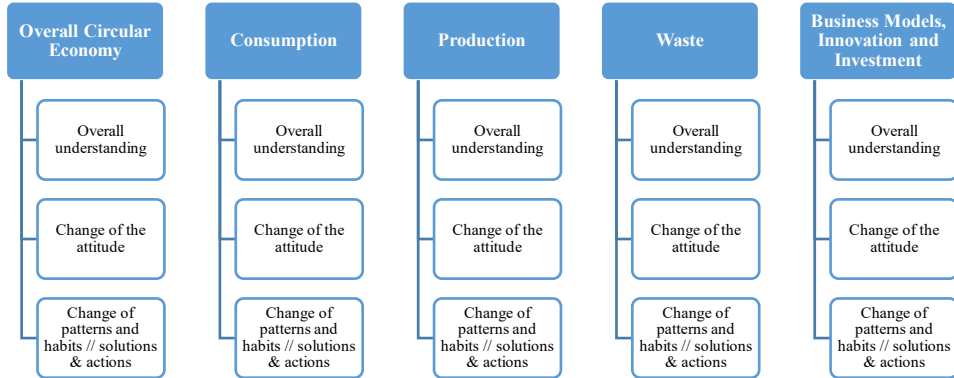
Overall Circular Economy	Consumption	Production	Waste	Business Models, Innovation and Investment
Overall understanding	Overall understanding	Overall understanding	Overall understanding	Overall understanding
Change of the attitude	Change of the attitude	Change of the attitude	Change of the attitude	Change of the attitude
Change of patterns and habits // solutions & actions	Change of patterns and habits // solutions & actions	Change of patterns and habits // solutions & actions	Change of patterns and habits // solutions & actions	Change of patterns and habits // solutions & actions

Fig. 3. Structure of Course DiGiTOOL to CE, created by authors.

In Figure 3 shown, how each "DiGiTOOL to CE" module consists of three different advancement levels:
1) Overall understanding
2) Change of the attitude
3) Change of patterns and habits // solutions & actions.

Each part of the module is designed for approximately 2 (two) academic hours. Hence, studying each module will take around 6 (six) academic hours and course DiGiTOOL to CE in total is designed for 30-35 academic hours allowing to obtain up to 3 ECTS credit points.

E-course is developed with modern authoring tool covered with creative and catching templates supported by several Learning Management Systems (e.g. Moodle or html) and supports SCORM (tracks, for example, how did students answered to quizzes and tests; tracking whether the student really took the whole e-learning course and how much time did it took, etc. to receive ECTS credit points.

The development of the study content is followed by the training of the instructors of the module - Design of DiGi MentorDiGi Mentor is an e-learning module and will strive to improve digital pedagogical competences of educators, enabling them to deliver high quality interactive digital education and to develop high quality digital content. The module is designed to serve as a handbook for any interested educational institution, individual lecturer or trainer willing further exploit DiGiTOOL to CE study course for developing a similar asynchronous online course for higher education institutions, e.g. on marketing or business plan development.

DiGi Mentor is in the development phase and indicatively will include:
1) Overall principles of developing independent asynchronous courses for high education institutions in business, economics or finance;
2) Recommended structure of the modules including integration of quizzes and tests to strengthen students' understanding of main topics of the course or module;

3) Creation of interactive and catchy content by using Authoring tools and their technical possibilities;

4) Principles of using ready made asynchronous e-course modules in blended courses

5) Creation of multinational partner consortium, approbation and other experience sharing items useful for the development of new online e-learning courses.

The work of the project continues and the authors will be happy for useful recommendations or suggestions for improving the E-course "Circular Economy", to create other courses on a similar principle.

4 Conclusion

- Digitalization is entering all areas of life, particularly in all education forms. To avoid routine work, teachers must learn to use technology to save time and achieve good study results. The exchange of experience makes it possible to improve your study courses.

- A valuable experience is acquired by teaching staff when they learn to do so. By feeling in the role of a student and meeting the requirements of studies, the teacher better understands the study process and the situation of formulating the requirements of his or her guided courses.

- More and more popular are different E-learning study courses. They are available on various platforms and to diverse audiences. Successful experience has shown that they can be integrated into the study process as optional courses. A successful solution is if individual topics can also be offered in other study courses.

- The experience of Erasmus + projects is the perfect way for professionals from different countries to combine their knowledge and expertise to develop a joint course of study.

5 Acknowledgements

References

1. Kiscenko, D. Atstaja, O. Onzevs, *Computerized distance education in business studies: problems and solutions in conditions of Latvia* in International Scientific Conference „Economics and management – 2002", Proceedings volume 1 "Human and Business", Kaunas, „Technologija", April 18-19, **1,** 70 – 73 (2002)

2. I. Uvarova, I. Mavlutov, D. Atstaja, *Development of the green entrepreneurial mindset through modern entrepreneurship education* in 8th International Scientific Conference on Sustainability in Energy and Environmental Science, 21-22 October 2020, Ivano-Frankivsk, Ukraine IOP Conf. Series: Earth and Environmental Science **628,** 012034 (2021) https://doi.org/10.1088/1755-1315/628/1/012034

3. B. Brigmane, Components of the pedagogical work at the university. *Proc. 76th UL Int. Scientific Conf. on Human, Technologies and Quality of Education* (Riga, Latvia, 2018)

4. Kiščenko, Dz. Atstāja, O. Onževs. "Problems and solutions of training businessmen VIA Internet", *Second International Conference "Simulation, Gaming, Training and Business Process Reengineering in Operations", Proceedings*. RTU, Riga, September 8 – **9,** 2000

5. D. Atstaja, R. Susniene, M. Jarvis, International Journal of Economic Sciences, **VI(2)**

(2017) https://doi.org/10.20472/ES.2017.6.2.001

6. C. Schimpf, M.M. Santiago, J. Hoegh, D. Banerjee, A. Pawley, International Journal of Gender, Science and Technology **5 (2)** (2013)

7. D. Dimante, T. Tambovceva, D. Atstaja, Int. J. Continuing Engineering Education and Life-Long Learning **26(3)** (2016)

8. T. Tambovceva, D. Dimante, D. Atstaja, Int. J. Environmental Technology and Management **21(5/6)** (2018)

9. G.C. Nobre, E. Tavares, Journal of Cleaner Production **314** (2021) doi:10.1016/j.jclepro.2021.127973

10. M. Burger, S. Stavropoulos, S. Ramkumar, J. Dufourmont, F. van Oort, Research Policy **48(1)** (2018) doi: 10.1016/j.respol.2018.08.015

11. J. Kirchherr, L. Piscicelli, Resources, Conservation and Recycling **150** (2019) doi: 10.1016/j.resconrec.2019.104406

12. E. Viles, F. Kalemkerian, J.A. Garza-Reyes, J. Antony, J. Santos, Sustainable Production and Consumption **33** (2022) doi: 10.1016/j.spc.2022.08.024

13. H. Kopnina, "Teaching circular economy: Overcoming the challenge of green-washing," (2018) doi: 10.1007/978-3-319-71312-0_48