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STEAM Education – An Effective Approach to Achieving Sustainability in Higher Education

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Abstract: *The present study represents a scientific foray, aimed at elucidating the role and indisputable contribution of STEAM skills in higher education, skills that are extremely necessary for educational actors in the era of postmodern education. The aim of the research is identification of the implementation directions of STEAM education applied in higher education institutions.*
In the preparation of this paper, we used qualitative research, content analysis of the reports of higher education institutions in the EU that allowed us to analyze the practices they use in the cultivation and foundation of STEAM skills. In addition to this, the Global Innovation Index repot and the Human Capital index were analyzed, which allowed us to elucidate the main challenges that the Republic of Moldova faces in capitalizing on human potential, in the generation and implementation of innovations. In conclusion, we can mention that universities, currently, must remodel their management system, adapt their curricula, in order to base new skills - STEAM skills, which help higher education institutions to focus on a new education - STEAM education, a digitized education, focused on the integration of innovation in the didactic activity, on national-regional-international cooperation in order to train competitive young people on the labour market, young people with a culture of innovation, young people who will contribute to the promotion of sustainability at the society level.

Keywords: *Sustainability, higher education institutions, STEAM education, STEAM competences.*

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Introduction

Currently, in the context of multiple challenges, operating in a constantly changing environment, higher education institutions must adapt to new changes, reinventing new methods of activity, a new management model focused on the foundation of new skills among students – the STEAM skills, which offers the opportunity to train competent, creative young people, able to easily adapt to the new context.

At the same time, the need for increased adaptability of higher education institutions is punctuated by a new paradigm of education – postmodern education, an education that stimulates and maximizes the human potential of educational actors, as well as elucidates the need to establish new skills among students through the prism of its fundamental elements: e-learning, e-tutoring, etc.

The topicality of the research theme is punctuated by the need for universities to be competitive, in the form of students who would manage to quickly integrate into the labor market, who would have the necessary skills for their employability, by integrating STEAM skills into course units, by reorienting universities towards a new paradigm of education – STEAM education (Suslenco & Doncean, 2021).

The need to research these aspects is an imperative one, because with the desire for the infiltration of postmodern education, with the need to face the requirements put forward by professional bodies from abroad, the need to form a theoretical-applicative basis, to substantiate the innovation field.

STEAM education is a field dominated by the need to train competitive graduates who will easily integrate into the labour market, who will manage to contribute to achieving sustainability. This field needs to be developed, scientifically substantiated by conceptual and practical research that would justify and evaluate the necessity of its application in universities within the country, but also in those abroad.

Literature Review

The need for higher education institutions to be competitive, sustainable, derives from the increase in competitive pressure, from the need to align with international standards, in order to interest students and face the new challenges of postmodern education (Suslenco, 2022, p. 119).

At the same time, the foundation of STEAM skills within higher education institutions is becoming a necessity for universities, as well as an

indisputable path to success, competitiveness and sustainability. (Suslenco, 2022).

Higher education institutions are the "artisans of new visions", they are the institutions that must inspire, create, plant correct visions, based on balance, fairness and strategic visions for the development of society (Doncean & Suslenco, 2022).

STEAM education is a new education that includes the introduction of new IT technologies in the educational process, the reorganization of the curriculum of the course unit in order to introduce interactive teaching methods, which include the use of new technologies, platforms, the introduction of contents that would help train responsible students, through the foundation of STEAM skills, which focus on the development of natural curiosity among students, independent thinking, as well as the curricular integration of innovations, the development of creativity (European Skills Agenda, 2023). At the same time, STEAM skills are derived from the new environment in which higher education institutions operate, which require the training of young people capable of solving real-life problems, of integrating into society by demonstrating a responsible behaviour.

The need for the foundation of STEAM skills derives from the mutations, the changes that have affected the universities. Analyzing the "Education 2030" Strategy, we can mention that it is based on the National Development Strategy "Moldova – 2030", which points out the sustainable development objectives, based on 4 fundamental pillars: Sustainable and inclusive economy; Human and robust capital; Honest and efficient institutions; Healthy environment (Moldova Education Strategy 2030; Moldova National Strategy, 2023).

According to the project of the "Education-2030" Strategy, "the *strategic goal* in the field of education is to provide opportunities for all citizens of the Republic of Moldova to develop, from the earliest age and throughout their life, the necessary skills, to capitalize on maximum potential both in personal and family life, as well as in professional and social life, as well as to adapt as easily as possible to the imperatives of the time, in particular, to those related to sustainable development" (Suslenco, 2021).

Analysing the mission of the Education Development Strategy for 2021-2030, "Education-2030" and the Implementation Program, we note that it focuses on "drawing the most pertinent and relevant directions and actions to solve problems in education to strengthen the positive image in society on the system and regaining citizens' trust in the need for the consolidation and sustainable development of this sector of society".

Studying the mission of the Strategy, we identify its foundation on the objectives of sustainable development stipulated in the "Agenda-2030".

As the general vision of the Education Strategy for the 2021-2030 years, "Education-2030", human capital appears in the foreground, which is "the safest capital of the Republic of Moldova, towards which the country's sustainable development policy must be oriented. The key factor in the formation of human capital is the education system – the main stake of the Republic of Moldova in solving the social, economic and demographic challenges that our country is facing today" (Moldova Education Strategy 2030, 2023).

Therefore, the need for educational institutions to reset their levers, to focus their attention on the construction of a route to achieve sustainability in educational institutions is emphasized. Breaking stereotypes, outlining commitments, identifying priorities, outlining the model for achieving sustainability is a sure approach to competitiveness and sustainability (Amarfii & Suslenco, 2018).

The combination of traditional methods with modern ones, the adjustment of outdated visions with the technological ones of the present, of classic lessons with interactive ones, the involvement of modern technologies in the teaching-learning-research process represent approaches based on the SDGs (Agheorghiesei, Asandului & Asandului, 2020).

Below I rendered schematically the pillars of sustainability of the Republic of Moldova in the educational sector (Table 1).

Table 1. Pillars of sustainability of the Republic of Moldova in the educational sector

Pillars	Essence
PILLAR No.1 "*Sustainable and inclusive economy"*	1. training and development of human resources for the national economy, able to ensure the development of the country; 2. entrepreneurial and economic education of the young generation, but also of the whole society; 3. the production and promotion of innovations, technologies for the national economy; 4. awarding the status of entrepreneurial institutions to certain professional-technical, specialized medium and higher educational institutions.
PILLAR No.2 "*Human and robust capital"*	The education system is the determining factor in the formation of human capital as a goal, and as a mechanism for the formation of society. The promotion of the concept "the quality of teaching staff - the quality of human resources - the quality of the economy - the quality of life" will ensure the achievement of the specific objectives of this pillar on the education dimension: promoting the lifelong learning; promoting the learner-focused education; promoting gender equality and inclusion, ensuring the right to quality education, ensuring access to education, etc.
PILLAR No.3 "*Honest and efficient institutions"*	The institutions of the education system represent the determining factor in ensuring the quality and functionality of this system through: effective democratic governance; development of organizational and educational culture; the development of human, financial, material, technological, logistical resources.
PILLAR No.4 "*Healthy environment"*	Within the education system, this pillar can be viewed more broadly, considering the safe, formative, inclusive educational environment, resistant to social, political, economic and pandemic challenges as a fundamental condition for the formation of human personality.

Source: National Development Strategy "Moldova 2030", 2023

From the data in the figure, we observe that, in order to achieve sustainability in universities from Republic of Moldova, there is a need to assume and respect the strategic objectives for each of the 4 established pillars. Thus, having at the centre the value axes of quality and sustainability, accessibility, adaptability, flexibility, productivity.

Rethinking Higher Education conference in Stockholm on March 30, 2019, O. P. Ottersen, president of the Karolinska Institute, argued that

"the sustainability goals are concrete and target each individual" (Agheorghiesei & Onofrei, 2019). At the same time, Ottersen mentions that their integration in higher education can be achieved through the lens of the 4Cs (Figure 1.).

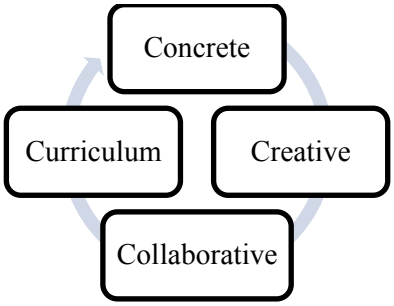


Figure 1. The "4Cs" of the integration of sustainability objectives in higher education
Source: (Agheorghiesei, 2019)

Concrete – as higher education institutions are meant to educate generations, to cultivate the desire to learn, teachers must have knowledge, skills, habits that help them for sustainability.

Creative – the teaching and research process carried out by teachers in higher education institutions must use creative, innovative methods that would sensitize, stimulate students to get involved in activities to achieve sustainability.

Curriculum – the contents taught by teachers must involve courses, contents, learning units focused on sustainability, where students would have the opportunity to substantiate their sustainability skills.

Collaborative – through the prism of cross-disciplinary collaboration, cooperation between education and research, between higher education institutions and all its stakeholders, higher education institutions will be able to implement, evaluate, coordinate, monitor and review the results obtained by the higher education institution on the dimension of achieving sustainability.

At the same time, at the same conference, H. Clarck, the former prime minister of New Zealand, pointed out the special importance of higher education institutions in achieving sustainability. The contribution of universities in achieving sustainability, schematically, is shown in Figure 2.

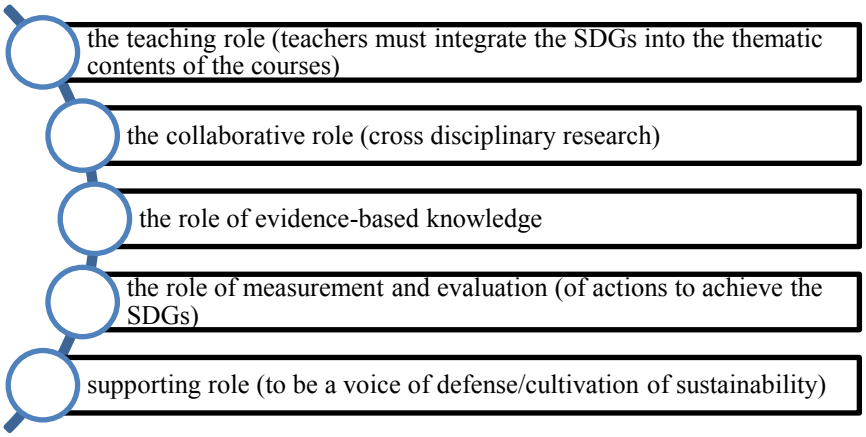


Figure 2. The role of universities in achieving sustainability at the societal level
Source: (Agheorghiesei, 2019)

Therefore, it can be stated that the actions of universities in the field of formal education, as well as non-formal (extracurricular) activities regarding the achievement of sustainability can have a positive impact on the formation of relevant skills for solving social and environmental problems.

So, following the research carried out, we can see that the need to base STEAM skills is punctuated by the new mutations faced by universities that impose the need to create new skills for students - STEAM skills that would help them to cope with the dynamic and different environment, to adapt to the demands imposed by employers.

Research Methodology

The present study represents a scientific incursion, aimed at elucidating the role and indisputable contribution of STEAM skills in higher education, skills that are extremely necessary for educational actors in the era of postmodern education. In the paper it was presented the review the most successful national, regional and international practices in the implementation of STEAM skills in higher education, on the one hand, as well as to elucidate the most relevant practices implemented by the large university centres in the EU in the integration of STEAM skills in universities.

The general objective of the research is to determine successful techniques in the implementation of STEAM education applied in higher education institutions.

The research scientific objectives:

O1: researching the contribution of STEAM education on competitive universityes;

O2: determining the successful experiences in implementing STEAM education in EU countries;

O3: elucidation of recommendations in the cultivation of STEAM education for universities from Republic of Moldova.

Research questions:

Q1: What is the contribution of STEAM education on the sustainability of higher education institutions?

Q2: What are the successful methods and techniques in promoting STEAM education, applied by the major university centres in the EU?

Q3: How can STEAM education be promoted in universities?

In the preparation of this paper, we used qualitative research, content analysis of the reports of higher education institutions in the EU that allowed us to analyze the practices they use in the cultivation and foundation of STEAM skills. In addition to this, the Global Innovation Index repot and the Human Capital index were analyzed, which allowed us to elucidate the main challenges that the Republic of Moldova faces in capitalizing on human potential, in the generation and implementation of innovations.

The epicenter of the research was based on the theoretical research of STEAM education concepts, postmodern education, supplemented by qualitative empirical research, based on the secondary data analysis from the reports of higher education institutions of research institutions.

Were analyzed He-innovate reports. Researching the content of the national reports of the EU countries, we selected for analysis the Netherlands, a country with a developed educational system, which harmoniously integrates the elements of postmodern education through the foundation of STEAM skills. At the same time, the Netherlands is a country that harmoniously integrates the higher education system in an exceptional cooperation with the business environment, a fact that helps young graduates to increase their insertion in the labour field. Simultaneously, the Netherlands is a leading country according to the positions occupied in the international rankings, a country that has one of the most efficient educational systems in the EU, a country with valuable university centres, which can serve as good practices for our contry. The Netherlands is struggling with the challenge of "creating value" from the excellent knowledge it produces in its higher education system. In this sense, universities in the Netherlands implement effective techniques to stimulate

entrepreneurial education, to generate new ideas and solutions to societal problems, as well as to anchor on the Sustainable Development Goals.

At the same time, they were analyzed two university centres in the EU were selected - the University of Applied Sciences in Tampere in Finland and the Technical University in Riga, which implement innovative methods, successful in promoting and substantiating STEAM skills in the higher education system. In this sense, the reports of these higher education institutions, published on the He-innovate platform, were studied and analysed

Another side of the research was directed to the analysis of the national system of higher education, with the elucidation of the need to substantiate STEAM skills in higher education institutions, a study that focused on the research of the Education 2030 strategy, as well as its correlation with achieving the Sustainable Development Goals. Although the strategy points to sustainability objectives in the higher education system, universities are less flexible in their orientation towards sustainability.

Results

Innovation represents a successful lever that will help universities in their orientation towards sustainability.

According to the WIPO Director General Daren Tang, "Innovation is critical to overcoming the common challenges we face and building a better future. The Global Innovation Index is a unique tool to guide policy makers and businesses in planning for the future to ensure we emerge stronger from the pandemic" (OMPI, 2023).

Thus, in this context, we consider the analysis of the Global Innovation Index relevant. Making an analysis for the year 2021, we can see that the leader, among the countries selected for analysis, is the Netherlands, which occupies the 6th position in the ranking, followed by Finland, with the 7th position in the ranking, Norway, with the 20th position. On the other hand, Romania - 48th position, followed by Ukraine -49th, and the Republic of Moldova - 64th. Thus, we can outline that the Republic of Moldova still has a lot to learn, capitalize and change, in order to consolidate its position. Thus, there is a need to stimulate the development of education, the stimulation of creativity and the involvement of students in research-innovation activities that will help the country become more competitive and will stimulate the change of Moldova's position in the ranking.

Based on the analysed data, we developed Figured 4, in which we reproduced the values of the Global Innovation Index, for the year 2021.

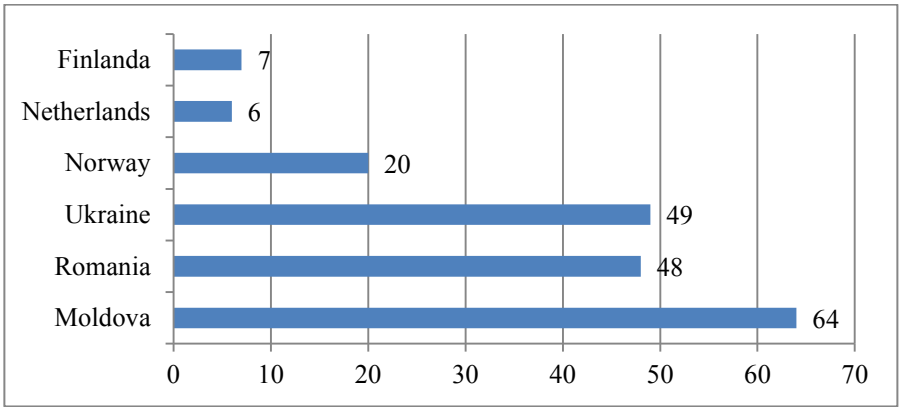


Figure 3. Global Innovation Index, 2021
Source: (Global Innovation Index report, 2021)

For the year of 2021, we can observe an imperative need for the substantiation of STEAM skills within higher education institutions, which can become a lever for the success of universities in increasing the role of innovation. At the same time, STEAM skills can influence the consolidation, generation of new innovative products, generated by the educational actors in higher education.

On the other hand, we consider useful the analysis of the Human Capital Index, in a regional and international context, for the year of 2020, which will help us elucidate the value of the country's human capital, which is a vital factor in the formation of STEAM skills as well as in achieving sustainability. Accordingly, we presented the synthetic data in figure 4.

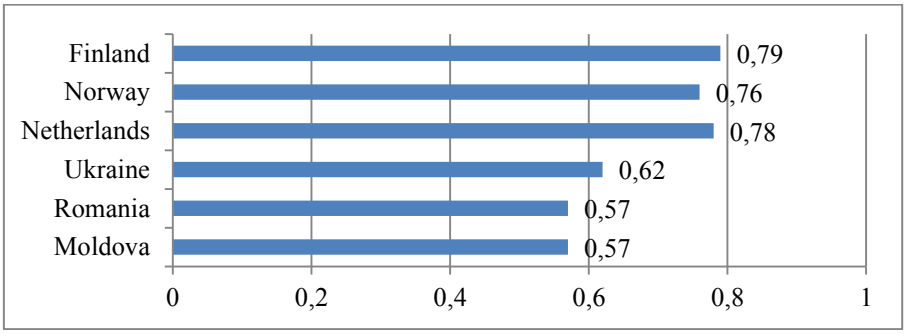


Figure 4. Human Capital Index, for the year of 2020
Source: (Human Capital Index Report, 2020)

Analyzing the Human Capital Index, we notice that our country and Romania, in 2020, recorded the same value, 0.57, the lowest values among the countries selected for analysis. At the same time, as we can see, Ukraine registered a value of 0.62, 0.05 points more than Moldova and Romania.

On the other hand, EU countries such as Finland, Norway, and the Netherlands are leaders in this ranking, occupying important positions.

In conclusion, we can reiterate that Moldova, Romania and Ukraine must develop their human potential at country level, strengthen their efforts in order to increase the country's human capital, which will positively influence the orientation towards sustainability as well as the remodeling of the higher education system by anchoring it to sustainability.

Higher education institutions are "artisans of knowledge, probes of innovation in society". Higher education institutions are intended to support innovation activities, to capitalize on the potential of educational actors in order to generate new ideas, new solutions, which will help society to become more competitive, anchored on solving the stringent problems of society.

The European Union includes developed economies anchored on innovation and sustainability. Through the Agenda-2030, the EU sets clear objectives, as well as measures to achieve the objectives. So, among the dimensions proposed by the EU are: Leadership and governance; Organizational capacity: funding, people and incentives; Entrepreneurial teaching and learning; Training and supporting entrepreneurs; Knowledge Exchange and Collaboration: The Internationalized Institution: Measuring the Impact (European skills agenda; STEAM Skills Drive Innovation and Future Growth, 2023).

In order to research the experience of an EU country in the implementation of STEAM competences, we have selected the Netherlands as a country for our analysis, which represents a leading country with the positions occupied in the international rankings, a country that has one of the most effective educational systems from the EU, a country with valuable university centers that can serve as good practices. The Netherlands is grappling with the challenge of "creating value" from the excellent knowledge it produces in its higher education system. In this sense, universities in the Netherlands implement effective techniques to stimulate entrepreneurial education, to generate new ideas and solutions to societal problems, as well as to anchor on the Sustainable Development Goals.

Universities in the Netherlands consider entrepreneurship and entrepreneurial skills to be crucial for the translation of research carried out, and entrepreneurship education contributes to increasing economic value

and, more broadly, to creating social impact (OECD Skills Studies: Supporting Entrepreneurship and Innovation in Higher Education, 2023).

In terms of leadership and governance, the universities in the Netherlands can be proud of excellent results through multiple initiatives and national policies to support the practical implementation of the scientific results obtained by the universities.

Thus, on the *leadership* and *governance* dimension, we can elucidate multiple policies applied within Dutch universities, such as (OECD Skills Studies: Supporting Entrepreneurship and Innovation in Higher Education, 2023):

1. *Entrepreneurship as an important part of the strategy of the higher education institution* – the strategies of Dutch universities focus on permanent cooperation with the business environment in the development of education plans, curricula, in the formation of skills, as well as in the implementation of the results obtained from the educational process;

2. *Policies to stimulate the valorization of the results obtained in the scientific environment by the business environment* – as early as 2004, the Dutch government announced that universities must achieve a "third mission" in addition to education and research, namely the valorization of the results obtained. Thus, the universities are supported to value the scientific results obtained, and to transpose them in the Dutch business environment;

3. *Cooperation of Higher Education Institutions - Business Environment* - as early as 2004, a National Agenda for Science was developed in the Netherlands in which representatives of the business environment participated and suggested that higher education institutions focus on aspects related to smart cities, circular economy, smart industry, production of sustainable food, energy efficiency;

4. *Introducing entrepreneurial education at all levels* – since 2000 in the Netherlands, decided to introduce entrepreneurship education at all levels. The goal was to strengthen the entrepreneurial climate through the lens of capitalizing on entrepreneurial education, which represents an interdisciplinary activity that involves cooperation with other specialized disciplines. Thus, as a result, multiple entrepreneurship centers were created, incubators with which the universities collaborated. Thus, entrepreneurship education has become part of the skills profile of a teacher as well as students at all levels of education.

5. *The development of models for the implementation of entrepreneurial activities within higher education institutions* – higher education institutions in the Netherlands adopt an efficient coordination and integration of different entrepreneurial activities.

6. *Creation of entrepreneurship centers* – Dutch entrepreneurship centers include 20 universities and perform various activities. Institutions undertake to cooperate with each other to: promote a community; exchange knowledge and good practices; stimulate and promote entrepreneurship and entrepreneurship education in higher education; strengthen entrepreneurship research by facilitating national cooperation and stimulating new research.

7. *Involvement of the business environment in all university activities* – according to a study carried out in the university environment in the Netherlands, over 86% of universities mentioned that representatives of the business environment are present in all university initiatives.

8. *Universities are centers for stimulating entrepreneurship and innovation from a local, regional and national perspective* – universities, through cooperation with the business environment, open centers of innovation and technological transfer. A relevant example would be the creation of the Creative Industries Center by the University of Amsterdam. The center includes over 50 representatives of the business environment, local public authorities, central authorities, aimed at increasing the valorization of the results of scientific work in the business environment.

On the second dimension of the Agenda-2030 "Organizational capacity: funding, people and incentives" higher education institutions in the Netherlands are distinguished by multiple successful practices such as:

a. *Entrepreneurial initiatives of universities are supported by various funds, sustainable financing* – a particular characteristic of the Dutch higher education system is the presence of entrepreneurial support within higher education institutions. Most of the funds are provided by private sponsors and investors, which represent more than 50% of the general budgets of the higher education institutions interviewed for entrepreneurship support activities.

b. *Promoting interdisciplinarity initiatives in entrepreneurship education* – both teachers and students focus on interdisciplinary research topics that can offer the possibility of integrating educational actors from various fields in order to obtain innovations and their transposition in the business environment;

c. *Increasing investments in the improvement of scientific and didactic personnel as well as those in the business environment* – the training of scientific teaching staff is well established in the Netherlands. Thus, the universities in the Netherlands develop their talent management by offering different training opportunities in the business environment, and vice versa, the personnel from the business environment participate in the training courses offered by the university environment.

d. *Providing rewards and incentives to scientific and teaching staff who support the implementation of the Agenda-2030* – scientific and didactic staff are motivated through various incentives to implement the agenda and achieve the expected results;

e. *Entrepreneurial skills training* – the scientific-didactic staff trains entrepreneurial skills in students by applying various methods such as: problem-based teaching, visits by teachers and students to companies, inviting business specialists to the classrooms.

A first university selected for analysis is Riga Business School, located in the capital of Latvia (Entrepreneurship and Digital Transformation at Riga Business School, 2023).

EU universities are focused on capitalizing on STEAM skills because they are aware of the need to promote sustainability, to achieve the objectives of the Agenda-2030 of the European Union.

In the following, we will present the successful expeditions and journeys in the foundation of STEAM skills, which we found applied within the *University of Riga Business School* and other institutions *University of Applied Sciences in Tampere, Finland.*

The most outstanding policies and practices applied by Riga Business School, in order to develop the entrepreneurial approach are (Entrepreneurship and Digital Transformation at Riga Business School, 2023):

1. *Cooperation between universities and the business environment* – the university organizes activities such as the "L-earn Business Caravan" in which high school students have the opportunity to compete for a scholarship in order to be admitted to studies for the specialty of "Business and Administration" or "IT Technologies".

2. *Organization of "Leadership and business projects" webinars in schools* – the university organizes webinars for school students on topics such as project management, leadership, thus attracting students to the university.

3. *Development of entrepreneurial skills* – the university offers multiple optional course units that students can select in order to build entrepreneurial skills. A relevant example is the organization of practical seminars by the university (at the end of the first year of studies) where students, divided into teams, receive a problem faced by a company, and try to generate solutions to solve this problem based on knowledge accumulated in various course units.

4. *Promoting an IT culture – as a factor in stimulating competitiveness and innovation* – the use of IT infrastructure to improve teaching in the educational system has been part of the changes made by the university over

the last decade. This is most evident in the content of its curriculum, which since 2018 has been increasingly oriented towards IT-based business opportunities.

5. *Carrying out online video lessons* – the university encourages the carrying out of online, video lectures by teaching staff from partner universities USA, Canada, Norway. University students often participate in exchange of experience activities, where they learn new skills, working with new students.

6. *Developing intensive educational marketing* – the university is present on various social media channels, where it promotes its educational offer, having multiple followers.

Another European university that was selected in the research we conducted is Tampere University of Applied Sciences, Finland.

In its entrepreneurship education offerings, the university applies an innovative approach to entrepreneurship education, focusing heavily on cooperative and team entrepreneurship, which stands out through multiple initiatives related to entrepreneurship and digitalization, such as:

a. *The university strategy includes a deep entrepreneurial orientation* – the general strategy of the university includes 6 areas of interest among which, two of them include the teaching of entrepreneurship and the entrepreneurship of well-being. At the same time, the university, through its Proacademy, Y-Campus programs, integrates entrepreneurship education in all university study programs;

b. *Attractive study programs* – in the field of entrepreneurship, the university has 2 attractive study programs: Proacademy and Y-Campus. Proacademy is a multidisciplinary entrepreneurship education program.

c. *Applying effective teaching methods* – in order to cultivate entrepreneurship education, the university in Finland applies modern methods focused on the use of IT technologies, problem-based learning, project-based learning, interactive teaching, group work, team learning.

d. *Cooperation between the university and the business environment* – the university has made the change of "Media and Arts" undergraduate programs to Mediapolis.

e. *Developing entrepreneurial skills for all university students* - the impact of the university's emphasis on entrepreneurship is reflected in the fact that approximately 20-25% of Proacademy graduates start a company within 5 years of finishing the program, compared to less than 5% for other graduates from other universities in Finland.

f. *The impact of educational education is always evaluated* – the impact of the educational education offered by the university is always evaluated, through its studies.

Limits and Discussions

In the present study, we can note the conceptual approach of STEAM education opts for the curricular integration of the contents and the scientific analysis of the subjects from the perspective of inter- and trans- and pluri-disciplinarity, focusing on the development of students' innovative and creative skills in solving problems and the creation of products through collaboration and cooperation, through the use of modern teaching methods, through the integration of IT in the educational process, which will allow obtaining creative young people, capable of solving problems in the actual environment, who will have a valuable human capital that will help countries to become more competitive.

The curricular integration of the contents starts from the planning of the teaching-learning-evaluation process that would aim at an interrelationship of the study subjects that would allow the creation of logical connections between the acquired knowledge and real life, which will contribute in unison to the formation of STEAM skills through a systemic view.

One of the limits of the research is the small number of university centers analyzed, thus, in the future the number of universities selected for analysis can be increased, which will provide the opportunity to obtain much more relevant results.

Another limitation of the research is the analysis of the national experience in the implementation of STEAM competences in higher education – the Netherlands. The representativeness of the analyzed research units, only a few universities in the EU being analyzed, the results cannot be interpreted from an international perspective.

Conclusions

In order to train STEAM skills in the university environment, there is a need to make changes from the top management, which later, be effectively transposed to all levels of university activity, faculties, departments. Just as the EU Agenda-2030 focuses on the development of skills related to the entrepreneurial environment, which focuses on the development of entrepreneurial thinking and the harmonious integration with IT technologies, which will help students become creative actors,

capable, after graduation, of solving problems in real life, to show responsible behavior towards society, to contribute to achieving sustainability.

In this sense, from the experience of the countries analyzed by us in the present study, for to substantiate STEAM skills, universities have to modify multiple elements, such as:

1. *Implementation of university sustainability management* – in order to substantiate STEAM skills, there is a need to change the management model applied within higher education institutions by reorienting it towards the business environment, towards achieving university sustainability by including tangible objectives in the strategic plan of universities related to achieving university sustainability;

2. *The foundation of an entrepreneurial E-education* – in view of the foundation of STEAM skills, there is a need to educate creative, competitive young people, capable of solving problems in the real life of enterprises. In this sense, there is a need to cultivate modern entrepreneurial education, focused on the use of IT technologies, by using case studies from the real life of enterprises in the educational process.

3. *Developing entrepreneurial skills for all university students* – in order to substantiate the STEAM skills, there is a need to strengthen the entrepreneurial skills of all students by including course units in the field of entrepreneurship in the study program.

4. *Applying effective teaching methods* – in order to cultivate entrepreneurship education, the university in Finland applies modern methods focused on the use of IT technologies, problem-based learning, project-based learning, interactive teaching, group work, team learning.

5. *Creating business incubators within universities* – In order to apply theoretical knowledge in practice, students have the chance to participate in solving case studies, developing business projects and winning them, as well as managing actual businesses, as happens in the University of Tampere, Finland. Thus, students, once they finish their studies and upon graduation, will be able to open and effectively manage a business.

6. *Modernization of learning unit curricula* – in order to train STEAM skills, there is a need to modernize the curricula of study units, to introduce new courses related to: sustainability, sustainable entrepreneurship, social entrepreneurship, Intelligent Information Technologies for Business, etc. which will provide the opportunity to train students with skills to think creatively, to solve real-life problems, to train future leaders responsible for the future of society, who will be anchored towards achieving sustainability.

7. *Opening attractive study programs* – attractive study programs include major concerns towards the business environment, society as a whole, with concern for achieving sustainability. Therefore, in order to train students able to manage efficiently, responsibly, and integrate harmoniously in achieving sustainability, there is a need to review the study programs and open competitive programs, such as Sustainable Entrepreneurship and Intelligent Information Technologies, which could attract young people, as well as they can be grounded in STEAM skills, so necessary in the context of postmodern education.

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