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PREFACE

The Erasmus Congress (ERACON) is an annual Conference, organized by the European Association of ERASMUS Coordinators (EAEC) where IR Officers, placement and Internship Managers, researchers and professionals with an interest in the ERASMUS+ programme are actively participating with presentations, workshops and paper submissions. ERACON 2022 was the 18th Conference organized since 2005.

CAREER-EU is also an annual Conference organized by the European Association of Career

Guidance (EACG) in cooperation with the European Association of ERASMUS

Coordinators (EAEC) hosted within ERACON. Career Guidance Counsellors and other experts make presentations and submit papers. CAREER-EU 2022 was the 13th annual Conference organized since 2010.

ERACON 2022 & CAREER-EU 2022, were held in cooperation with the University of Makedonia and the EUROTRAINING Institute. Plenary speech was given by the ERASMUS Unit of the European Commission. The Congress was organized as a hybrid event on 27 June - 01 July 2022. In this electronic publication, presenters share their papers with those interested to read further on the content of their presentations. Views and opinions expressed are those of the authors only and do not necessarily reflect those of the European Association of ERASMUS Coordinators.

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EP4 - USING INTERDISCIPLINARY PROBLEM-BASED LEARNING AND CRITICAL THINKING IN CYBER TRAINING

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ABSTRACT

The intensive use of technology, innovation within cybercrime and rising number of cyber-attacks to personal and organizations have bad consequences for all aspects of work and life. To anticipate and defend against internal and external cyber threats is a urgent but complex problem to be solved. It is known that due to their complexity, most real-world problems like this one cannot be solved by using knowledge only from a domain; for understanding of complex issues, there is a need to combine many aspects i.e. sustainability, critical thinking and interdisciplinarity together. It is expected that education and training enhance learners' competence in dealing with such complex issues professionally as well as interdisciplinary. This paper presents an attempt of using Interdisciplinary Problem-based learning (iPBL) supporting development of critical thinking within the cybersecurity Erasmus+ project Interdisciplinary Cyber Training (InCyT).
Effective cybersecurity specialists as well employees and managers of organizations should have the critical thinking skills and mindset that enable them to avoid cyber-attacks. Strong critical thinking enables i.e., cybersecurity specialists and mangers to make decisions about data security, to assess and manage technology risks, to plan, evaluate, and implement cybersecurity measures, to respond to security breaches/threats. Within the two-year Erasmus+ project InCyT, a cybersecurity competence framework that vocational training and companies can use to improve competencies and skills of employees and employers in order to avoid cyber-attacks, a digitally supported interdisciplinary training program and a mentoring one by using iPBL and supporting critical thinking for small and medium sized companies (SMEs) employees and employers have been developed. An adapted version for vocational training and an European transferability model will be also developed.

Introduction

The intensive use of technology, innovation within cybercrime and rising number of cyber-attacks to personal and organization have bad consequences for all aspects of work and life. This requires and increased focus on the defensive measures and has a high priority on global policy, national security agendas and education (Newell,

2009). In response, the Cybersecurity Policy Review (Donovan et al., 2016; Hamburg, 2021) demands for a national strategy to develop awareness and incorporate a cyber-secure workforce having expertise and skills to be cyber-ready against the potential threats faced by all nations. National Initiative for Cybersecurity Education (NICE) (https://www.cisa.gov/nice-cybersecurity-workforce-framework) underlines that in many important areas an "integrated cybersecurity workforce" is necessary also due to many complex cyber-attacks. For example, every work role in the apparently technical "Securely Provision" workforce category, requires non-technical knowledge of "laws, regulations, policies, and ethics as they relate to cybersecurity and privacy". The question, then, is how to develop a workforce with these interdisciplinary skills. There is a serious need for cybersecurity talent and suitable education and training facilities to develop new ones to solve complex problems.

Complex real-word problems require for their understanding and solving a combination of educational and training approaches like digital supported Problem-based learning (PBL) critical thinking and interdisciplinary methods (O'Brien et al., Schmidt 2008; Blake et al. 2013). One of such complex and actually problems is to anticipate and defend against internal and external cyber threats in organizations.

It is expected that education and training enhance digital and interdisciplinary learners' competences in dealing with such complex issues (Newell 2009). But there are many aspects to be considered in this context besides necessary digital skills i.e., learner problems overcoming barriers of disciplinary differences and ways of teaching (Braßler, 2016), uncertain teachers/mentors, chaos in organizing interdisciplinary courses (Scheer et al. 2012), and the fact that education and training institutions are unable to evaluate these problems, particularly when they have to be solved urgently.

In connection with cyber-attacks, effective cybersecurity specialists, managers, should have the critical thinking and other necessary skills i.e., digital ones that enable them to anticipate and defend against internal and external threats. The challenges of working in these rapidly changing and complex fields require the ability to act well in highly precise contexts as well as ambiguous and uncertain one, to analyze problems, to evaluate alternatives, and the competences and skill to explain clearly what needs to be done, and why. Applying these competences and skills in speedy, effective, and organized measures requires corresponding training and taking responsiveness. Particularly small and medium sized companies (SMEs) need help in this context.

This paper presents some characteristics of Interdisciplinary Problem-based Learning (iPBL) supporting development of critical thinking and digital skills and then an application with an Erasmus + Project. Within the two-year Erasmus+ project InCyT, a cybersecurity competence framework that vocational training and companies can use to improve competencies and skills of employees and employers in order to avoid cyber-attacks, a digitally supported interdisciplinary training program and a mentoring one by using iPBL and supporting critical thinking for small and medium sized companies (SMEs) employees and employers have been developed. An adapted version for vocational training and an European transferability model will be also developed.

Interdisciplinary PBL

Problem-based learning (PBL) theory consider learning as an active, constructive process where the teacher acts more as a facilitator of student learning. Students become more experienced with PBL and finally they adopt many of the facilitators' roles.

PBL helps students to solve ill-structured problems, to identify and acquire missing information (Barrows 2002; O`Brien et al., 2019). Students could follow a deeper understanding of the learning content (Torp and Sage 2002) and develop critical thinking (Tiwari et al. 2006). PBL has a positive effect on students' attitude and engagement because learners consider their gained reasoning and processing skills to be valuable (Ahlfeldt et al. 2005).

Interdisciplinary PBL (iPBL) is necessary to solve interdisciplinary problems, corresponding conflicts, and to increase the ability to discover common elements and interdisciplinary integration possibilities. iPBL can be structured to follow eight steps to problem solving and students work in groups having different roles in their group (Braßler, 2016; Bradbeer, 1999; Blake et al., 2013).

- Clarification of terms from different disciplines: After reading the problem, iPBL learners together with the teacher/trainer/mentor discuss explanations across the disciplines. This develops understanding and awareness about differences between disciplines as well as the necessity of interdisciplinarity to gain a holistic approach to solve the complex problem.
- Formulation of the interdisciplinary problem to be solved including aspects of all disciplines involved.
- Interdisciplinary brainstorming: Learners develop ideas, explanations, and hypotheses for the problem across the disciplines. Mapping of main tools and concepts will be a help (Woods 2007).
- Interdisciplinary structuring: Learners identify discrepancies, interrelationships and gaps in the classification of their previously collected ideas and try to develop an interdisciplinary understanding.
- Formulation of interdisciplinary learning objectives: Learners together with the teacher/trainer/mentor formulate interdisciplinary learning objectives on the basis of lacking and needed knowledge. These should reflect common interests and facilitate learning across disciplines related to the problem.
- Self-study by reading papers across disciplines: Learners should have time to choose papers provided by the teacher/trainer/mentor or find themselves appropriate ones in their own time. It is useful that learners prepare an own report from their discipline and one from a foreign discipline.
- Interdisciplinary post-discussion: In a discussion, answers and learning objectives across disciplines are presented in a report. Each student explains concepts, theories, and research from foreign disciplines. This is important for connecting ideas across disciplines and identifying integrative solutions.
- Formulation of an integrative team statement: A task of written statement (report) defines mutual agreement and final integration of ideas for the solution.

Technology can support learning in PBL and iPBL. Tools such as online surveys, polls and collaborative online workspaces engage students and help teachers to follow student progress, understand their interests as learners. It is important that a used technological tool supports development of a community of learners, promotes

collaboration as well as positive well-being. Learners should apply new skills in a context which can be facilitated through tools such as virtual reality, online forums, blogs, discussions and communication tools to connect chats.

Improving critical thinking skills

Critical thinking is the process which occurs when a person analyzes, evaluates, and interprets information and then applies it corresponding; it is an ability which is beyond memorization. In order to develop it, they should be encouraged to think for themselves, to formulate questions and hypotheses, to analyze and synthesize the events, then develop new hypotheses and test them against the facts.

It is important that one of the aims of education is the developing of students' thinking skills. According to Paul & Edler (2008) students are not passive but active while they are realizing critical thinking. Students should be helped to adapt to ever-changing situations and problems, and critical thinking is an essential skill in this context.

Questioning is an important teaching tool, but it should not be a simple recall of information. Students can use the internet to research and seek solutions to complex problems. But due to a big amount of information available to them, students need questions which allow them to investigate rather than simple search.

Critical thinking is important in many domains i.e., in cybersecurity enabling experts and managers to apply quantitative and algorithmic skills, to make decisions about data security, to assess and manage technology risks, to plan, evaluate, and implement cybersecurity measures, to respond to security threats. To learn how to analyze information critically and then apply the results for solving problems and making decisions should be is one of the purposes of education and training. So critical thinking skills can be achieved during the learning/training process.

There are many strategies on how to develop critical thinking skills in learners, i.e.by asking questions that make the students to develop their own beliefs on common topics. It is necessary to encourage group discussions to enable the students to listen to others and share their opinions. Some students can be involved in innovative activities, other can assume different roles in a cybersecurity situation that needs a decision. Brainstorming is a learning tool, particularly combined with visual elements.

It is important that teachers/trainers/mentors enable students to share their ideas, consider other peers' perspectives, develop a sense of awareness. They learn to be responsive, and to listen to others and teachers/trainers/mentors should encourage students to work in this context. It is important that learners cultivate their own ideas and build their confidence.

Referring companies, Hirose (1992) underlines that employers complain about employees' lack of reasoning and critical thinking abilities. Those abilities are essential because the modern work environments, not only in cybersecurity, requires more thinking and problem-solving abilities. This situation can be considered within training. Teachers, trainers, mentors need to be equipped with high critical thinking skills. Critical thinking should not be understood as equal with intelligence and shouldn't be misunderstood with it ; it is a skill which can be developed (Paul, R. 1989).

Interdisciplinary Problem-based Learning and Critical Thinking in Cyber Security Training within an Erasmus + Project

Cybersecurity is interdisciplinary; professional research shows that security activities contain strong elements of social, legal, ethical, sociological, psychological, technical, but also economic and managerial ones. Not all security professionals as well as managers and employees understand all of these fields that themselves influence careers, so it is to expect that organized teaching and training facilities will be contributed to develop interdisciplinarity in this context. So i.e., fundamental principles of technical cybersecurity can be combined with other areas with interdisciplinary concerns. The study of networks, Internet regulation, social interactions, management, system design, and finance are all affected by and influence the problem of cybersecurity. An interdisciplinary training program for managers, consultants and employees in companies can encourage them to communicate more, foster idea flow and lead to a common terminology and goals. This is necessary to solve communication problem; unfortunately, there is a lack of communication, particularly in small and medium companies (SMEs), also due to staff shortage, less time or competence.

Referring cybersecurity education, it is usually taught in a lecture-based setting with laboratory-based exercises which has been proved useful to provide students with hands-on experience. This approach, however, does not provide students with opportunity to explore the complex and often ill-defined cybersecurity problems in real-world, so other methods should be used.

Problem-based learning was originally used for medical education, but over the years, the model has been adopted to teach concepts in other disciplines including economics and business administration, architecture, law, engineering and social work. Unfortunately, problem based learning has not been explored systematically for cybersecurity education. Particularly iPBL supported by digital developments is promising to address the challenges in cybersecurity education and training and to develop also critical thinking skills.

Within the two-year Erasmus+ project InCyT with seven European partners from University, Research, VET, SMEs, a cybersecurity competence framework that provides a mechanism for vocational and educational training (VET) and SME business to describe and improve the competencies and skills that employees, managers (also cybersecurity professionals) are required to have in order to prevent cyber-attacks has been developed.

Du also to digital developments workplaces are changing and the workforce has to change/adapt (Hamburg, 2021). Interdisciplinary skills are considered one of the essential ones for the existing and future employees. And the results of an interdisciplinary training approach are beneficial. Employees also should understand and make connections across different tasks and different knowledge and skills, improving also their employment opportunities.

Taking into account the advantages of interdisciplinary training and mentoring programs, as well the development of problem solving and critical thinking skills, the InCyT team project develops, and tests a digitally supported interdisciplinary

training program and a collaborative learning platform for SMEs managers and employees.

This training program will be customized for vocational training and for development of a European transferability model. The project partners decided to do a common preparatory work including short interviews with cyber consultants for SME (in order to decide which training modules are necessary and will be developed), Short Desk-Research studies within the project partner countries to describe the situation about cybersecurity measures in their countries and necessary new ones to avoid cyber-attacks and decide main aspects to be considered as well as contribution of InCyT. SMEs in particular are objectives for criminal activities connected with less cybersecurity measures. In contrast to large corporations, their resources are limited - and hackers know that. The SMEs are the backbone of the economy in Europe, i.e., over 99 percent of companies in Europe are SMEs and have less resources. More than half of the workforce in Europe are employed by SMEs. Therefore, it is necessary to help SMEs to avoid cyber-attacks. Cooperation and communication between educators, researchers and people using information technologies are necessary. One problem is that companies, especially SMEs with fewer resources, need help assessing the skills and skills gaps of their employees, using digital methods to improve the existing situation and organizing training opportunities to reskill their employees. The following Figure shows some activities in this context which are supported by the project InCyT.
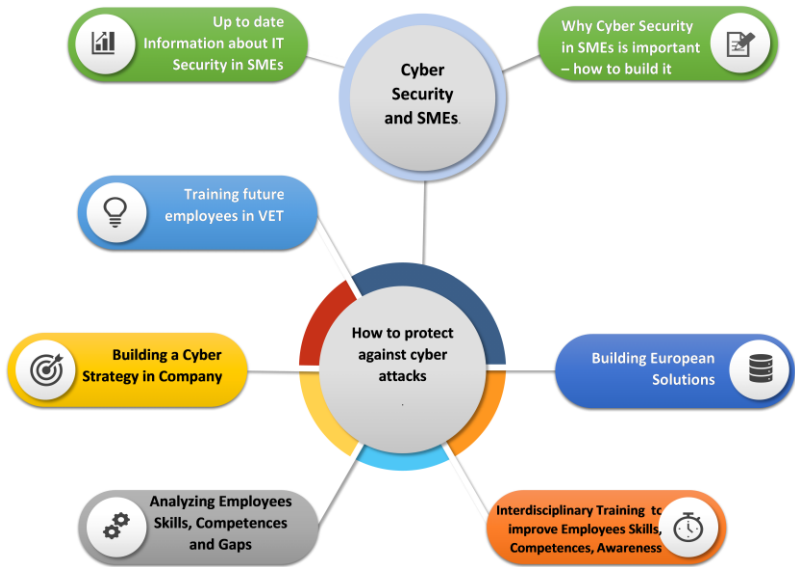

Figure 1: Activities supported by InCyT

The InCyT training program, is structured across two modules, one for Managers, one for Employees, where each module consists of a number of units and topics.

The program will be delivered by using an interactive digital platform, streaming Webinars, Quizzes, self-assessment exercises and ones those answers will be put on discuss forums, electronic portfolios. The exercises should contribute to the development of critical thinking. Each week the mentor should hold a short briefing

of learners of what is required from them for that week. Solutions of the problems saved in discussion forums will be also discussed in groups.

Two developed modules within InCyT are about social engineering and social networking. Social engineering is a significant threat to information security referring to malicious activities done through human interactions. An interdisciplinary approach to understand this phenomenon and all its complexities is necessary. Literature reviews highlight perspectives from different disciplines: information technology, psychology, business and ethics.

Phishing is one of the most popular social engineering attack types; phishing scams (frauds) are email and text message campaigns aimed to give an impression of urgency, achieve curiosity or fear in victims. One exercise of iPBL within this module was about creating and launching phishing attacks and exploring measures when phishing e-mails come. Knowledge from other processes has been collected. Learners can use the collaborative project platform and also other ones as well as web-based software which allow multiple users to work, revise and comment simultaneously.

CONCLUSIONS

Cybersecurity is an important issue in companies also due to many cyber-attacks and it is also much researched but not enough considered relative to other fields. It is rooted in traditional computer science but has connections with other disciplines. The urgency of quickly protecting against cyber-crime makes necessary consideration of interdisciplinary trajectories or collaboration between disciplines in this context also in education and training. Problem-based Learning (iPBL) combines two teaching methods: Problem-based Learning and interdisciplinary learning and foster a multi-perspective approach to real, complex problems like cybersecurity.

Critical thinking skills are required to avoid malicious attacks and cybersecurity specialists should be helped through suitable training and projects to have such skills and mindset that enable them to anticipate and defend against internal and external threats.

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EP15 - THE COVID-19 PANDEMIC IMPACT ON ERASMUS+ MOBILITY AT *SPIRU HARET* UNIVERSITY

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ABSTRACT

The main consequence of the COVID/19 pandemic was the economic crisis: inflation, unemployment rate growth, output and trade decrease a.s.o. But more important than this is the change in the way of working and living. And most important the use of computers and Internet became a much more used way of working and studying.

The HE institutions along with high-schools and gymnasiums had to adapt to online activities. But this wasn't to go by itself. Most of the institutions were not prepared to such a wide operation. First of all there was the lack of computers, than the lack of experience among teachers, and last, but not least, the absence of Internet connections for some regions of the country. The article shows how did Spiru Haret University (SHU) deal with the new challenge. SHU was one of the first universities in Romania to inaugurate distance learning in 2000-2001. Starting with 2002-2003 academic year the distance learning was introduced besides full-time and part-time (blended) learning.

Starting 2006 the University purchased the e-Learning Blackboard Platform meant to be used by all the students. Gradually, the Platform gained importance and became an essential element in teaching and assessing the students' activities. As we will show, the Erasmus+ mobilities affected by Covid restrictions have smoothly passed to online activities. The online courses were welcomed by the students, by all the students, as well as by the Erasmus+ incoming students. Now, at the end of Covid-19 pandemic, the students prefer the online courses.

The pandemic disaster

The COVID-19 pandemic is considered to have been a disaster. Its economic, political and, most of all, psychological outcomes are still fresh. Apart from the number of deaths, though I do not really trust statistics in general, the restrictions had an overwhelming impact upon population.

However, not any disaster is a real disaster... The pandemic was the occasion for change. The isolation made people use Internet technologies and devices more frequently than before.

The change

We could conclude that if the COVID-19 pandemic had an „aim", then this was reached: emphasizing and accelerating digitalization. Therefore, starting February 2020 HEI had to move towards eLearning platforms more quickly than their previous rhythms.
Not all the institutions were prepared to make the shift from traditional, face-to-face activities to on-line courses.

The new way

Transition from classical education to the digitalized one required at least three prerequisites:
1. The endowment with equipment: PCs, laptops, tablets, cell phones;
2. A qualified staff, able to adapt the shape, structure and presentation of the courses according to the new requirements;
3. Students prepared to receive education in a great different way than they were used to.

The transition from physical, face to face courses to online courses was not very easy for all the scholars and students. As a matter of fact, „Universities had to switch to emergency remote teaching (ERT) mode (Hodges et al., 2020; Marinoni et al., 2020), which forced university
officials, faculty and staff to work out quickly adaptable solutions to ensure the continuity of education online. ERT placed unexpected burdens on the shoulders of both faculty and students as they had to adapt to the new forms of teaching and learning."
(Rita Koris and all, 2021, p. 463)

The new way with Spiru Haret University (SHU)

USH was one of the first universities in Romania to promote Distance Learning courses.

Starting 2006 SHU acquired the Blackboard e-learning Platform. The Platform has been completely used since 2007, i.e. for courses and evaluation by all the students of the university: full-time attendance blended and distance learning.
The students became used to Platform's resources and accessed it for learning as well as for assessing activities.

The Erasmus+ students at SHU

The transition highly depended on the practices adopted until then. From this point of view SHU was prepared. The teachers were yearly trained in using the e-learning Blackboard Platform, and the students acquired during the first year of studies the knowledge and the skills to use it in their turn. The spring semester 2019-2020 found students during their Erasmus+ mobility at SHU. „Students had been informed of the closures of university campuses, and institutions had switched to ERT." (Rita Koris and all, 2021, p. 469). This happened with SHU, too.

Some of the Erasmus+ students decided to go back to their country, but most of them remained in Bucharest. All of them continued under the new circumstances. First, they were asked if they wanted to go back to their countries and very few decided to do so, because of their university decision. Most of the incoming students decided to stay in Bucharest during the restrictions period. Secondly, they were introduced to the e-learning Platform, which was only partly used for the Erasmus+ students' mobility.

Then, the timetable was rescheduled for Google-Meet meetings. The courses held this way were and are not essentially different from physical, face-to-face activities. One problem was the fact that most of the students were using cell phones. They were asked to get a laptop in order to assure a better communication with the teacher. All of the students finished their exams at the end of semester: the students who left for their country, as well as the students remaining in Bucharest.
For the fall semester 2020-2021, the Erasmus+ incomer students were advised from the very beginning to use a laptop or a desktop for their participation during the courses.
As during the autumn the restrictions persisted, courses have followed the model already inaugurated during the period March-June 2020. It was surprising that all the Erasmus+ students adapted quickly to the new approach of learning.

The students are now, after the restrictions have ceased, more willing to continue with the online courses than to come back to face-to-face activities. In fact, most of the regular Romanian students have become addicted to

online activities. So, we can say that the COVID-19 pandemic gave us the opportunity to accelerate the transition to fully digitalized activities in HEI. The use of the Blackboard e-learning platform along the last 17 years made this transition smoother.

We are waiting for our new Erasmus+ students with the expertise of 17 years of distance and blended learning, as well as with the integrated experience of the last two years.
The most important result of the pandemic experience with students' Erasmus+ mobility is the necessity to create a special partition for Erasmus+ students on the e-learning Platform. So, it
will be easier for them to identify and access the specific courses in English.

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EP20 - IMPACT OF COVID 19 PANDEMIC ON ERASMUS+ MOBILITIES:

ESKISEHIR TECHNICAL UNIVERSITY CASE

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ABSTRACT

One of the areas where the negative impact of the Covid 19 pandemic was evident was on the mobility activities of the students in different countries through Erasmus+ exchange programs. In this context, the purpose of this study is to assess the impact of the pandemic on the mobility of Erasmus+ Program students in the sample of Eskişehir Technical University (ESTU) and to investigate the problems encountered by the students. In this regard, a survey was conducted on how ESTU exchange students in different countries and institutions were affected by the pandemic in the spring semester of the 2019-2020 academic year, and it revealed how students were affected academically and socially by the process.According to the findings, more than half of the participants (approximately 55%) completed their mobility online during the pandemic period and stayed in the host country. 25% of the participants returned to their home countries due to the pandemic stated that they received a 'very low' level of 'academic/professional benefit' from their mobility, and about 13% indicated the 'psychological' area in which they were most affected.

1. INTRODUCTION

The Covid 19 pandemic, which has affected all sectors worldwide, has also had an impact on different mobility programs including Erasmus+, which mainly covers European countries. As Europe became the epicenter of the pandemic, countries had to take measures such as cancelling flights, closing borders, and suspending face-to-

face education. Measures to prevent the spread of the pandemic prevented the implementation of most of the ongoing or planned Erasmus+ activities.

Given these measures, one of the most affected areas has been the education sector, in which international students have also been included. Many universities have postponed or canceled campus events, conferences, sporting activities and other events around the world due to the taken measures.

With the start of the pandemic, it can be said that a process full of ambiguity has begun for students abroad within the scope of Erasmus+. It is important and necessary to see the effects of the pandemic on students who had to make difficult decisions, such as staying in the host country or returning to their home country immediately, and to foresee what kind of roadmap can be drawn in such extraordinary situations such as the Covid 19 pandemic.

2. REVIEW OF THE LITERATURE

The Erasmus Program, which was started by the European Union in 1987, is an important initiative that contributes to the internationalization of institutions and individuals. The Covid-19 pandemic, which has affected higher education institutions as well as the whole world, has spread rapidly since December 2019 and has also had an effect on exchange programs. Travel restrictions imposed by countries to prevent the spread of the pandemic, suspension of face-to-face instruction by higher education institutions, and measures taken to enhance social distance have prevented the implementation of most ongoing or planned Erasmus+ activities. It has become important to monitor the impact of the pandemic on mobility processes, to know how beneficiaries have decided to continue their mobility and to understand the gains they have made, both academically and socially. In this context, a number of studies have been carried out on the impact of travel restrictions on students who have already started their mobility in the host country. Bahadır, N. H. and Gürsoy, S. (2020) examined the beginning and improvement of the Erasmus+ program and the reflections of Covid-19 on Erasmus+ mobility programs on the sample of Kırklareli University. In the study, interviews were conducted with the participants entitled to benefit from Erasmus programs in the 2019-2020 and 2020-2021 academic years. In this study, it was understood that student mobilities were affected negatively. Following this, it has been stated that the unfavorable impacts of the pandemic on internationalization processes of higher education institutions will soon to be more observable.

Another study conducted by QS (2020) shows the significant impacts of Covid-19 on students and international education. The study examined to what extent the cross-border educational plans of the students participating in the study were affected by Covid 19. 46% of the students stated that their education plans were highly affected, while 29% stated differently. 47% of the students decided to postpone their education plans. In the process, it was concluded that productive outputs were obtained regarding online education, and 51% of the students preferred to continue their studies through online education and demanded more online courses. On the one hand, Koris, R., Mato-Díaz, F. J., et al. (2021) investigated the transition processes of beneficiaries of the Erasmus mobility for studies into the online learning environment in the Spring term of 2020. According to their findings, students whose social interaction has been restricted experienced difficulties during online learning.

In another study, Eraydın, C., Kin, Ö. K., and Toparlak, B. (2021) aimed to measure how Erasmus exchange students managed their health processes and their anxiety levels during the Covid-19 pandemic. The study was conducted between May-July 2020 via online survey method and included 185 students, and students studying in Romania and Poland participated in the survey. As a result, it was determined that high levels of anxiety were experienced by the students during the Covid-19 process, and that the male students experienced more anxiety. Another result is that the anxiety levels of the students who stayed in the host country were found to be higher among the students who did and did not return to their country.

Similarly, the aim of this study is to measure the impact of the Covid-19 pandemic on Erasmus+ program student mobilities and to analyze the problems experienced by the students in the higher education institution on the scale of Eskişehir Technical University. This study is important in terms of reaching the findings on how ESTU students were affected by the pandemic while in Erasmus+ program, which aims at youth mobility, inclusion/inclusion, experience sharing and cultural interaction. In addition, with this pandemic, which affects all countries in an unpredictable way, it is also meaningful in terms of revealing the effects of the measures taken by the institutions within the scope of the program on the users/beneficiaries.

3. METHODOLOGY

This study is a quantitative research and was conducted with a screening model. The survey model is a research approach that aims to describe a past or present situation as it is. In this approach, the event, individual or object that is the subject to the research is tried to be defined in its own conditions and as it is, without intervention (Karasar, 2008).

As a data collection tool, a questionnaire form shaped in accordance with the 5-point Likert scale developed by the researchers will be used within the scope of the research. This digital questionnaire, consisting of a total of 2 parts and 9 questions, was shared with the participants in the computer environment and the answers were compiled the same way.

55 students of Eskişehir Technical University, who were abroad within the scope of Erasmus+ in the spring semester of 2019-2020 Academic Year, were taken as a sample and statistical analyzes of the results were carried out.

4. FINDINGS

Within the scope of the research, it is possible to state that the participating students were mainly having their mobility in Poland, Germany and Lithuania considering the host countries during the pandemic period (See; Figure 4.1). Distribution of the participants regarding the faculties shows that approximately 49% of the students affected by the process studied under the Faculty of Engineering and approximately 35% under the Faculty of Architecture and Design (See; Figure 4.2).

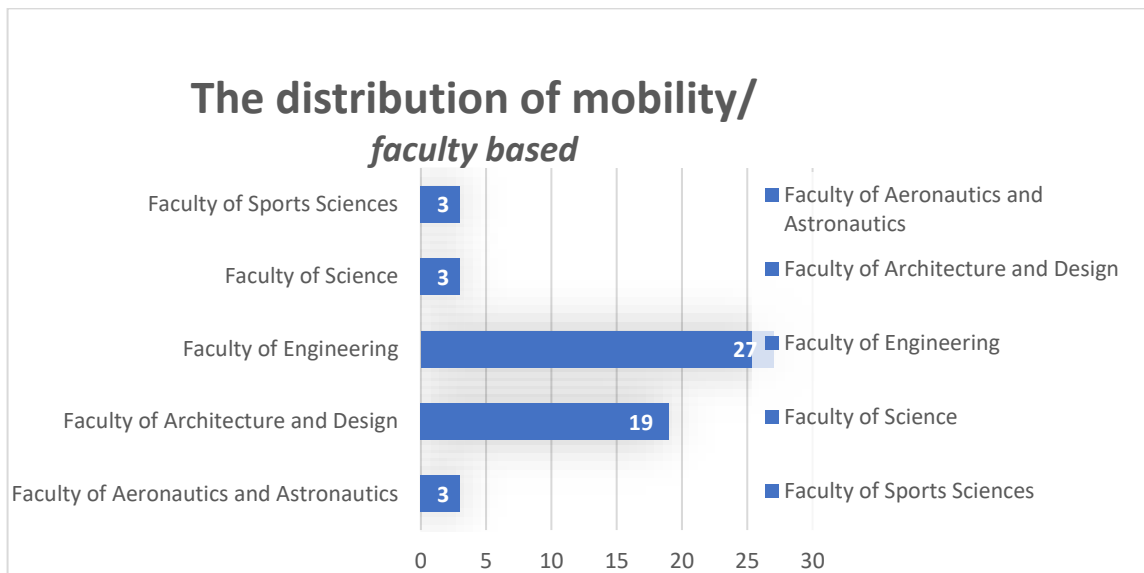**Figure 4.1:** The Distribution of the Mobility / Country-based
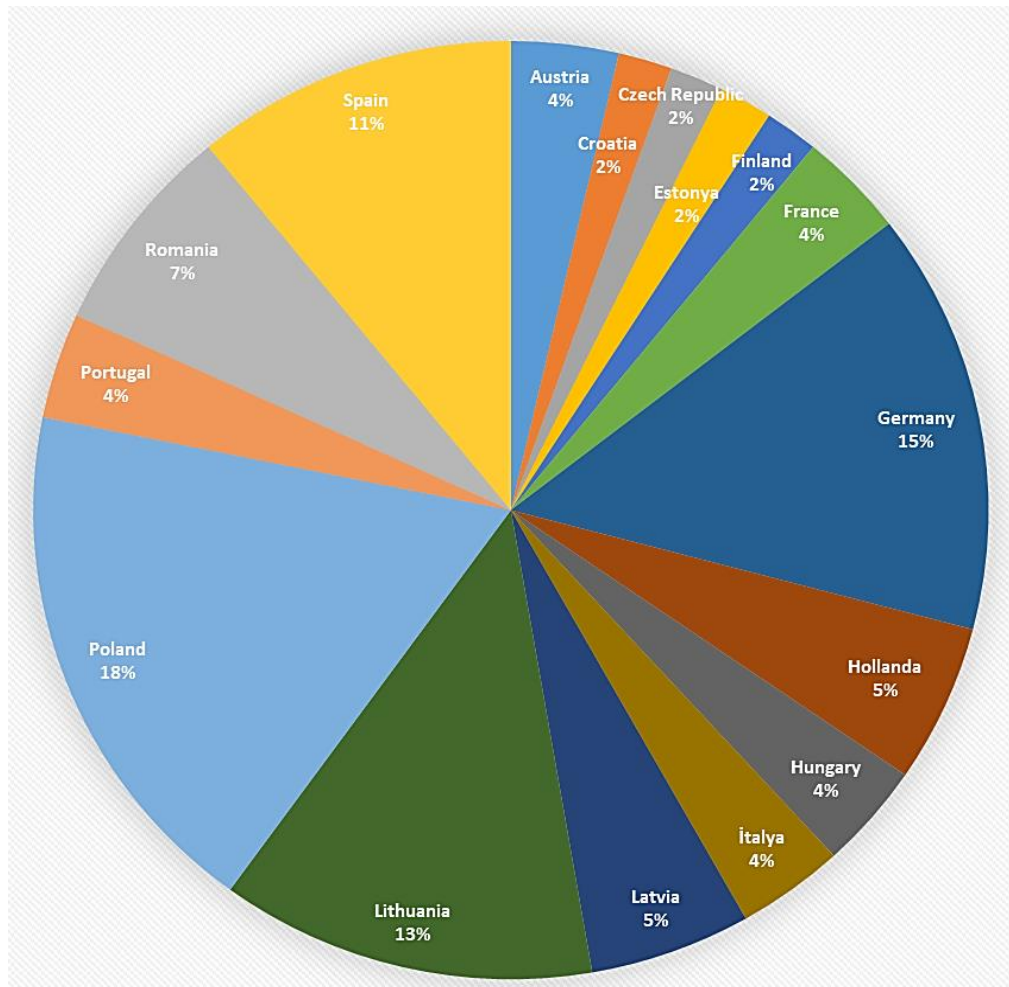
Figure 4.2: The Distribution of the Mobility / Faculty-based

With the spread of the pandemic, countries started to implement different practices regarding education. Many institutions have started to offer international students various ways to continue their studies such as freezing their semesters, continuing through online education, or returning to their own countries and continue their education in their home Universities. According to the findings obtained within the scope of the research related to this process; 55% of the participants remained in host countries and continued their mobility process via online platforms while 28% of the participants returned to ESTU. Moreover, approximately %8 of the participants returned to ESTU but still continued their semester via online platforms of host institution(s) and approximately %9 of the participants returned to country but froze their academic semester.

Considering the purpose of the mobility program, the areas that students are most affected are measured; approximately 64 % of the returned participants and approximately 44 % of the participants who remained in host countries pointed out the the psychological aspects as the most affected field. Approximately 67 % of the returned participants and approximately 74 % of the participants who remained in host countries declared a low level of effect on health, accommodation, and food fields.

As seen in Graph 4.3 and Graph 4.4 below; During the Erasmus+ mobility process, the findings regarding whether the participants had problems with the grant payments due to the pandemic and whether they caught the disease were examined. According to this, It was determined that a very large part of the participants (93%) did not have any problems with the grant payments in the process, and again, a high percentage of the participants (95%) did not have the disease during their mobility. (See; & Graph 4.4).
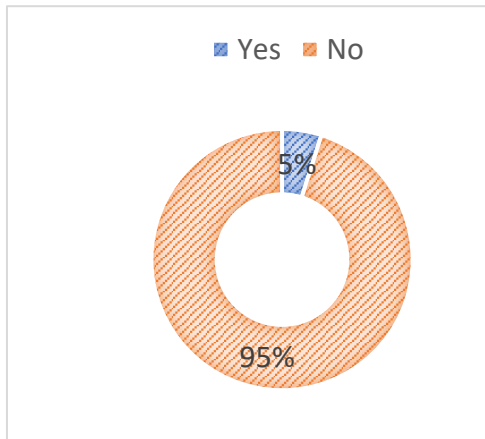
Figure 4.4: During your mobility, have you been infected by Covid-19 in the host country?
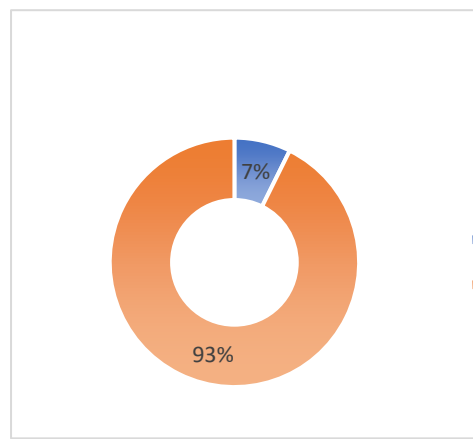
Figure 4.3: Have you had any problems with grant payment during your mobility period due to the pandemic?

Finally, when the support received by the participants during the process is evaluated, 'Psychological Counseling' was evaluated as the most insufficient support among the pandemic measures taken by the host institutions. When the evaluations of the experience related to mobility are analyzed, it is seen that the participants who ended their mobility due to the pandemic and returned to their home countries, %25 and approximately 54 % of the total participants declared a low level of academic/professional benefit from their mobility but fortunately 30 % of the participants evaluated their mobility experience as positive. Approximately 28% of all participants rated their mobility experience as 'neither positive or negative' compared to participants in previous years.

5. CONCLUSION

According to the findings of the study, similar to the studies in the literature, it was determined that the most affected area from the process was the 'psychological' dimension. Although the participants in this study appear to have been affected by the process by having their international education process interrupted in a relatively small proportion, it is reasonable to conclude that results in line with the literature have been attained given the students' mobility experience is appraised favorably in a low percentage of cases.

It is also expected that these findings will enable this ESTU become more competent in similar situations, to establish proactive ways and procedures, as well as providing guidance to the International Relations Units of all other institutions. It would be beneficial to determine the effects of such an epidemic, which profoundly impacts the entire world, in all areas, with more thorough studies that cover broader time periods and include larger participant groups.

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EP8 - INCYS 4.0 - TRAINING INDUSTRIAL OPERATIONS TECHNICIANS IN CYBER SECURITY

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ABSTRACT

Information Technology and the Internet of Things (IoT) are utilized to automate manufacturing, increase productivity, and resolve issues without the need for human intervention. This automated industrial environment presupposes that the personnel is capable to identify potential cybersecurity threats and able to respond adequately when an attack is identified. Nevertheless, there is a lack of well-trained technicians and industries can hardly find qualified personnel. Industrial Cyber Security 4.0 - InCyS 4.0- is a two-year EU funded project that aims to fill the gap and provide industry the necessary open-source tools to train their personnel. This paper describes the rationale, aims and objectives of the project and presents the produced course material and its deployment to project's partners pilot installations.

INTRODUCTION

The industrial landscape in the modern era have emerged new risks concerning cybersecurity which industrial employers should be aware of. When cyber risks and dangers are detected, industries need qualified personnel who are aware of the implications and dangers and who can immediately respond and minimize the risk.

During the last decade, cyber-attacks against Industrial Control Systems (ICS) have increased dramatically. Recent research from Kaspersky [1] (a world leading

company specialized to cybersecurity) revealed that cyber-attacks targeted - approx.-. one-third of industrial control systems (ICS) during the first six months of 2021. Cyberattacks may result in huge financial losses, data breaches, society disruptions, and eventually impact human   safety. One recent cyberattack was the Colonial Pipeline breach [2]. Hackers used compromised VPN credentials to gain access to IT (Information Technology) department of the company. The hackers managed to gain access to almost 100 gigabytes of corporate data and threatened to reveal them if the ransoms weren't paid. The company proactively shut down a major fuel supply for the East Coast of USA, to examine whether there was a physical damage to the pipeline (Operational Technology - OT) after the cyberattack. When they were convinced that nothing happened to the infrastructure, they paid $4.4million – in cryptocurrency- to hackers to restore their systems. However, the shutdown of the fuel supply -which was the first in company's history- resulted to reduction of the production and eventually higher fuel prices.

Norsk Hydro, a multinational aluminium manufacturing company, was forced to close or move offline many of its factories, when hackers attacked the company [3] by exploiting the LockerGoga ransomware [4]. The attackers hacked the IT systems of the company's smelting plants in Norway, Qatar, and Brazil. The total cost of the attack was estimated to $75 million. In another case, hackers attacked Renault-Nissan by utilizing the WannaCry ransomware [5]. When the attack was identified, the company isolated the infected plants – situated in England, France, Slovenia, Romania, and India - from its network. In general, the WannaCry ransomware is estimated to have infected approximately 200,000 devices in over 150 countries. The total financial loss by the specific attack is estimated - worldwide- to be $4 billion.

The aforementioned examples show that industry must take immediately countermeasures to prevent cyberattacks. ICS attacks are on the rise due to the convergence of OT and IT. This convergence provides hackers the opportunity, by compromising the corporate –IT- network to gain access to the industrial –OT- network as well. Furthermore, the majority of the industrial machines run outdated software which is very easy to be compromised. Even when there is no convergence, the interdependency between the OT and IT systems provides a reasonable rationale for the shutdown of the OT segment to reduce further risk.
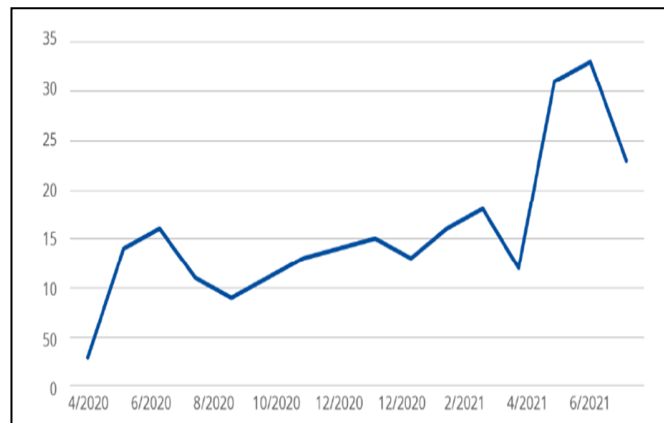
Figure 1: Ransomware incidents observed by ENISA (April 2020-July 2021) – Source: [6]

The convergence between OT and IT, the connected technologies like Industrial Internet of Things (IIoT) and the remote access capabilities, offer to modern industry ease of monitoring and eventually an increase in production. Nevertheless, if no cybersecurity measures are taken the industrial process efficiency and safety are at a high risk (Figure 1).

Recently, Artificial Intelligence was utilized to identify and prevent cyberattacks [7]–[9]. These AI models are able to "learn" the entire infrastructure, from computers on the IT -the corporate network- to HMIs and PLCs in OT. This way when an intruder tries to enter to the infrastructure, the AI model identifies the malicious activity and manages to stop attacks in IT before they can spread to OT. For example, an energy supplier in North America prevented a cyber-attack [10] by deploying self-learning AI, avoiding this way their operational processes to shut down.

However, this cutting-edge technology cannot be adopted by SMEs (Small and Medium Enterprises) easily, due to high cost and lack of knowledge. Each company should employ qualified and trained staff. A well-trained operational technician will be able to identify a cyberattack and prevent it or at least limit its impact. Nevertheless, there is a great lack of well trained -to cybersecurity- operational technicians.

The modern industrial environment with all the above-mentioned risks that lurk, requires at least technical operators and supervisors using CNC/PLC in automated systems, robotics, electronic maintenance, I.T., etc., to be aware of the risks and have the knowledge to implement preventive measures and solutions. The competence and training of technicians and engineers to meet the new challenges of the modern industrial landscape is extremely important. However, the reality is different; companies admit [11] that they are unprepared for the cyber threats that are now a daily occurrence. A recent study [11] found that most of the surveyed executives believe that they lack the qualified and skilled personnel needed to effectively implement and maintain a secure industrial environment.

Technicians working in industry are not adequately trained about the new hazards and/or have the competences to take sufficient preventive security measures. InCyS 4.0 (Industrial CyberSecurity 4.0) came to fill this knowledge gap and help industries to confront the new era risks. The project InCyS 4.0, co-funded by the Erasmus+ Programme of the European Union (2018-1-ES01-KA203-050493) [12], offered open-source course materials and higher education training to fill the evident gap in awareness and competence in cyber security for operational technicians in Industry 4.0.

Moreover, the project designed a comprehensive training programme for high-level industrial and operational technicians, working in critical infrastructures or in industrial production. The project strengthened the co-operation between education, research and industry by offering high-quality learning opportunities, that improve workers' technical skills to meet the needs of the new era.

The rest of the paper is structured as follows. In the next Section the methodology of the project is described, while afterwards the produced educational material is presented. The pilot installations to each partner and the project evaluation are also reported and finally, in the last section conclusions and future research directions are given.

METHODOLOGY

InCyS4.0 was a 2-year EU-funded project concerning creating material about cybersecurity for IT/OT technicians. The partnership consisted of two HEIs (Higher Educational Institutes), one Vocational Education and Training (VET) and a consulting company from Greece, Spain and Portugal. The initial phase of the project concerned a field research in every partner country. The field research had the form of an anonymous questionnaire targeting the IT personnel of local industries, to investigate the security weaknesses of the participating enterprises and adapt its training content according to the feedback. At least 10 representative large enterprises or SMEs were participated from each partner country. Due to the criticality and the significance of the given information, a confidentiality agreement was signed. It was very interesting to find out that the results were almost identical to each partner country. An extensive and detailed report to the questionnaire can be found in [13]. The most major conclusions derived from the processing of the questionnaire are as follows:

• 80% of the enterprises answered that they implement a security policy at their organization. However, there is still a 20% which do not have any security policy. Moreover, for the companies that do have a security policy, when we thoroughly examined the answers to other questions we found that their policy had a lot of weaknesses. For example, only 45% of them implement a password policy, and of those only ¼ of them has very strict rules.

• Another key point is that 40% of the participating companies do not have their network equipment physically secured in a restricted access room. It is easy

to understand that in these cases anyone (employee or visitor) could have access to the infrastructure and compromise the network in order to gain remote access.

- • Although, the majority of the companies do not permit their personnel the use of their personal computers/laptops, they allow them to bring their own devices to their offices. This way an employee could easily install through a usb flash drive, malicious software to the network.

- • Moreover, the CNCs/PLCs installed to the companies use outdated software. In most cases, the Operating System (OS) is Windows XP which stopped receiving security updates almost 15 years ago. The update/upgrade policy for the firmware used in their automation machines, is almost non-existent.

- • 70% of the enterprises don't train their personnel to cybersecurity issues and 67% cannot estimate the cost of recovering the current status of their automation network in case of a major disruption caused by a security breach.

- • 40% of the companies do not have a backup strategy and from the rest 60% who have, only 50% make a frequent check to their backups.

- • 70% of their companies do not segment their network into subnetworks i.e. IT network, OT network, guest network etc.

- • 70% of the enterprises allow remote access to their organizational OT network but there is a 30% which do not use secure connections (VPN, SSH tunnels) to their network.

- • Only 50% of the enterprises do have a contingency plan in case of a cyber-attack.

From the aforementioned findings, it is obvious that cybersecurity is almost nonexistent for most of SMEs. The main reason is that people are unaware of the threats, the risks they undertake and the consequences of a possible cyber-attack. In the cases, that SMEs are aware of the risks, the major drawback of the lack of well trained personnel is that cybersecurity training is typically of high cost. To overcome this, InCyS 4.0 produced educational material and distributed it –free of charge- through the project's website [14].

PRODUCED EDUCATIONAL MATERIAL

The educational material developed by the project for training of the technical personnel in industries, comprises of three modules in four languages (English, Greek, Spanish, Portuguese). The three modules are a) Module 1 which is entitled "Industrial Systems", b) Module 2 which is entitled "Security Concepts in Industrial Environments" and c) Module 3 which is entitled "Confidentiality, Integrity, Availability in Industrial Environments"

Module 1 is an introduction to the architecture of the ICS systems presenting the main components of them. Initially, the main components in an automated

environment are presented (e.g. PLC, sensors/actuators, HMI etc.), giving a classification of the five functional levels in automation. Afterwards, IT network main characteristics (e.g., topologies, addressing mechanism, main protocols etc.) are described, to give trainees a basic overview of what a computer network is. Finally, industrial networks are described in detail (equipment and protocols), comparing the OT network concepts against the IT ones.

Module 2 is focused on cybersecurity issues. First, the definition of Plant Security is given and most common means (e.g., CCTV, biometric readers, access controls etc.) of the security measures that a plant installation has are presented. Afterwards, network security and system's integrity are described. Module 2 afterwards deals with Operational Technology (OT) and IT (Information technology). The definition for both sectors is given and also the way those two different sectors are combined in a unified industrial environment is described. Advantages and disadvantages for OT/IT are presented along with some basic policy principles that an industrial infrastructure must retain. The main subject of Module 2 is the most common cybersecurity threats, how these are described and how they can be identified in an early stage of deployment and how to prevent them. More specifically, the following cybersecurity attacks are described a) Denial of Service (DOS) b) Distributed DoS (DDoS) c) Volume-based Attacks d) Protocol Attacks e) Application Layer Attacks f) Man-in-the-Middle (ARP Protocol - ARP Spoofing - Dictionary attack - Phishing attack - SQL Injection) g) Modbus attacks. Finally, in Module 2, the Information Society Law of Services and Electronic Commerce, its directive, aim and scope is given along with European Union's recommendations for combating cyberattacks.

Module 3 is focused in technological infrastructures resiliency to ensure business continuity running without or with minimum interruption. A secure system (secure technological infrastructure) is considered the one that is kept in operation within the expected qualitative and quantitative parameters (SLA - Service Level Agreement). Any deviation in these parameters is considered a failure. These parameters involve the triad of computer security: Confidentiality, Integrity and Availability. The module describes concepts related with secure systems, designed to ensure business continuity which involves weighing costs and benefits in order to obtain an acceptable probability of failure. Some important terms like Fault Tolerance, Fault Avoidance, Fault Detection, Business Continuity Plan (Figure 2), Risk Assessment, Disaster Recovery, Contingency Plan and Security Policies are addressed during this module.
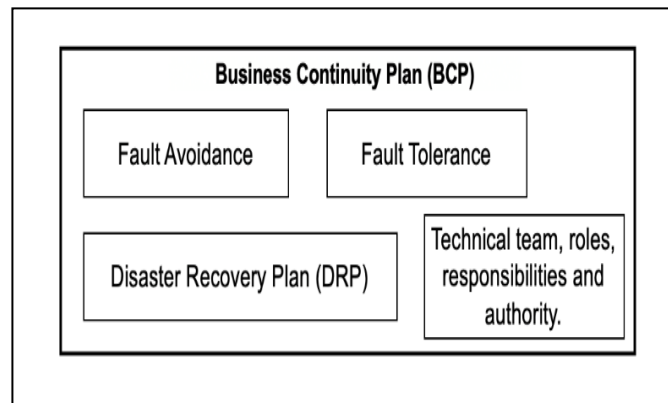
Figure. 2: Business Continuity Plan

Upon completion of the training course, the participant was expected to:

• Understand the main differences between security policies that are carried out in IT and OT environments.

• Analyze the main vulnerabilities and threats that can be suffered in industrial environments.

• Know the different types of attacks that can be made to an OT network or a critical infrastructure.

• Introduce the most important aspects associated with the protection of critical infrastructures and current regulations.

• Describe the main countermeasures that can be included to strengthen industrial networks and protocols.

Along with the produced educational material, some practical examples were given. The practical examples in Module 1 concern the basic networking concepts e.g. what is an IP address, how to find it, how to segment a network, how to connect to a network through SSH etc. In Module 2 the trainee has a detailed guide of how to perform –and eventually identify- a phishing attack, a DOS attack, an SQL injection attack and a dictionary attack. In Module 3 the practical examples describe how to backup and restore files, how to encrypt/decrypt messages and how to perform an encrypted communication.

Furthermore, a complimentary handbook in the form of a Quick Guide is given, summarizing the main risks and steps to follow for technicians working around digital control systems in Industry 4.0. (Figure 3).
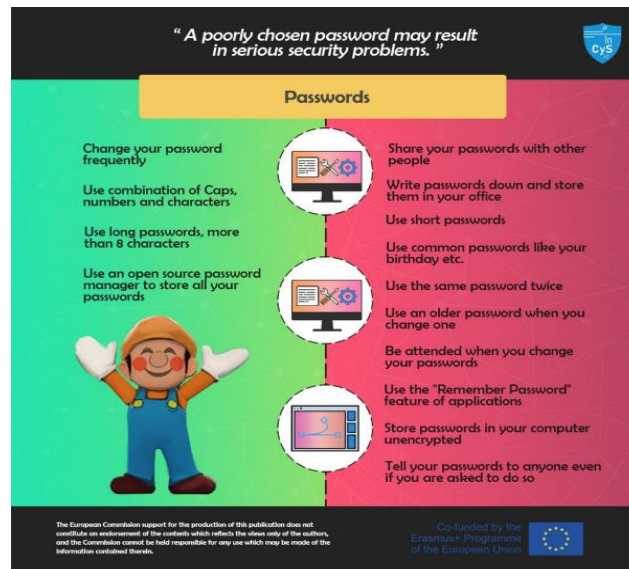
Fig. 3: Sample page from the quick guide

The produced educational material, the practical examples and the quick guide are available for download in the projects' website [14].

PILOT INSTALLATIONS AND EVALUATION

Four pilot installations took place (one per each partner). The course material has been uploaded into project's Moodle platform. Trainees were asked to register into the Moodle platform and complete the course. In order to characterize the participation to the program as successful, participants had to:

- Read thoroughly and understand the content of each module. Each module is split into smaller units. At the end of each unit, the participant should answer correctly to an activity (with a minimum of 80% correct score) in order to move to the next unit.

- At the end of each module, the participant should answer to a questionnaire to evaluate the module he/she has just successfully finished.

- When the participant finished successfully the three modules, he/she should also answer a more generic questionnaire to evaluate the whole course.

A participant was considered as successful only in the case that he/she met all the aforementioned conditions. The completion of the modules and the activities led to a certificate of completion. In Greece, 43 participants have enrolled into the course, 35 of them have completed it and 28 of them have answered the final evaluation questionnaire and get the certification of completion. In Spain, over 40 IT students enrolled into the course and completed it successfully. The evaluation

of the participants was very good and they have found the course very interesting, although some trainees reported that there was a lack of interaction and found the course mostly theoretical. It is worth noting that the European Union characterized InCys 4.0 as a good practice example [12]. The evaluation results were exploited by the partnership in a new Erasmus+ project called "Digital Training for Cybersecurity Students in Industrial Fields – DICYSTECH", which offers a more advanced course -comprised of five (5) modules-, and three fully developed remote cybersecurity laboratories in which learners can practice, experiment and develop their cybersecurity skills in a simulated industrial context [15].

CONCLUSION

In this paper the EU funded project InCyS 4.0, was described. The project highlighted the reasons that lead to security unawareness of SMEs, the risks they embark on, and tried to fill the educational gap in order to give open-source material concerning cyber security to IT/OT technicians. The produced training material comprises of three modules, many practical examples and a quick guide. The project's results were tested by pilot installations performed in each partner's country and the results were promising. The outcomes of the project highlighted the need of the creation of more flexible training tools regarding cybersecurity as there are limited -open-source- courses. The European Union has characterized the project as a good practice example.

ACKNOWLEDGMENT

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CP2 - MULTICULTURAL LITERACY AND SELF-DIRECTED LEARNING COMPETENCIES – NEW COMPETENCIES FOR NEW JOBS IN FUTURE AND TODAY

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ABSTRACT

World in all times was interrelated and now even more. Our actions, as well as attitude and opinion, have a great influence on others, even from a distance. As well as the cultural differences that influence everyone's perception, behaviour, working and learning style and etc. At the same time, we need more tolerance and empathy to understand and accept others, especially those who behave, think, and act differently, also in the teaching/learning process. The need for multicultural literacy, which could be described as the ability to understand and appreciate the parallels and differences between customs, values, and beliefs of your culture and a different culture, is obvious. As well as competencies of self-directed learning. Their significance was confirmed by online studies during the quarantine because of COVID-19. The analysis of theoretical and practical discourse emphasizes the need for their development for future jobs as well as their relevance in today's teaching/learning process. Multicultural literacy and self-directed learning competencies are the 21st-century competencies that are needed to become active citizens who will work towards achieving social justice within communities and in the entire world (Boutte, 2008). One of the possibilities to develop students' multicultural literacy self-directed learning competencies is to involve the main ideas, principles, attitudes, and skills of multiculturality in the study programmes and other extra-curriculum activities. The presentation will be based on the survey and experience analysis of Siauliai State University of Applied Sciences in developing those competencies for our national and international students.

Multicultural literacy is important for all citizens in a democratic multicultural society (Banks, Russell, 2003, Banks, 2009) at least because nowadays it is more and more difficult to find the monoculture society. Multicultural literacy should help students to develop the 21st-century skills and attitudes that are needed to become active citizens who will work towards achieving social justice within communities and in the entire world (Boutte, 2008, cit. Multicultural & Global Literacy …, 2017).

Multicultural literacy consists of the skills and ability to identify the creators of knowledge and their interests (Banks, 1996, cit. Banks, Russell, 2003), to uncover the assumptions of knowledge, to view knowledge from diverse ethnic and cultural perspectives, and to use knowledge to guide action that will

create a humane and just world. P. Freire (1970, cit. Banks, Russell, 2003), already states that we must teach students to read the word and the world. Reading the word requires basic knowledge and skills. However, reading the world requires students to question the assumptions of institutionalized knowledge and to use knowledge to take action that will make the world a just place in which to live and work. P. Freire also states that we must teach students to combine critique with hope. When we teach students how to critique the injustice in the world we should help them to formulate possibilities for action to change the world to make it more democratic and just. In other words we need to believe that all the problems - also those based on the cultural background - can be solved and all the challenges can be overcame. That attitude is necessary because critique without hope may leave students disillusioned and without agency. Education for literacy should include a focus on democratic citizenship and social justice because highly literate individuals, groups, and nations have committed some of the most unconscionable acts in human history. Germany was one of the most literate nations in the world when its leaders presided over the killing of 12 million innocent people. Victims of the Nazis included six million Jews as well as people with disabilities and people who were gay. In his Letter from the Birmingham Jail, Martin Luther King, Jr. (1963/1994) wrote, "Injustice anywhere is a threat to justice everywhere" (p. 2-3). When a society sanctions injustice toward one group, other vulnerable groups become potential victims. Consequently, students need to understand the extent to which their own lives and fates are tightly tied to that of powerless and victimized groups in society. (cit. Banks, Russell, 2003)

And that difficulty will occur only if the concept of multiculturality we will base only on the traditionally announced ethical differences. But if we will operate the modern concept of the culture where the cultural differences could be distinguished according to the gender, age, social status or location, we cannot find any monoculture society at all. In any society there will be people of different genders, age, social status and etc. and to co-work and co-live together we need knowledge, skills and attitudes necessary for living and co-working in multicultural society.

World in all times was interrelated and now even more. Our actions, as well as attitude and opinion, have a great influence on others, even from a distance. As well as the cultural differences that influence everyone's perception, behaviour, working and learning style and etc. At the same time, we need more tolerance and empathy to understand and accept others, especially those who behave, think, and act differently, also in the teaching/learning process. The need for multicultural literacy, which could be described as the ability to understand and appreciate the parallels and differences between customs, values, and beliefs of your culture and a different culture, is obvious. As well as competencies of self-directed learning. Their significance was confirmed by online studies during the quarantine because of COVID-19. The analysis of theoretical and practical discourse emphasizes the need for their development for future jobs as well as their relevance in today's teaching/learning process. Multicultural literacy and self-directed learning competencies are the 21st-century competencies that are needed to become active citizens who will work towards achieving social justice within communities and in the entire world (Boutte, 2008). One of the possibilities to develop students' multicultural literacy self-directed learning competencies is to involve the main ideas, principles, attitudes, and skills of multiculturality in the study programmes and other extra-curriculum activities.

Comparative analysis of theoretical discourse (Jandt, 2013, Pruskus, 2012, Baraldsnes, 2012, Starkey and others, 2010, The Handbook of Intercultural ..., 2014, etc.) enabled to identify the main aims and objectives of education of multicultural literacy. The most important aims in this aspect are the following:

- **Understand** your own and other cultures,
- **To avoid cultural prejudices** about your own and other cultures,
- **Evaluate cultural diversity**,

- **Become open** to cultural differences, otherness, change,
- **Learn to seek compromises** in a culturally diverse environment.

It is also possible to distinguish the following objectives of multicultural literacy development:

- **Understand that our culture has influence** on our understanding of another culture, and that the culture of other persons' has influence on their perception. It means to understand your own and other cultures; to understand yourself in the culture, to be aware of your own stereotypes and prejudices you have, to identify stereotypes and prejudices in everyday life.
- **Know and recognize** your own and other cultures
- **Develop provisions** that means to know the values of your own and other cultures, to accept and respect cultural differences yours and others, to evaluate cultural diversity, to encourage openness to otherness, to believing in possibility to solve cultural conflicts.
- **Develop skills, especially such as** communication and interaction with people from different cultures, work with people from other cultures, ability to see the everyday things and events from new corner, to adapt in changing environment, society, to make new decision.

The most effective ways to develop those knowledge and skills are the following:
- Recognition of otherness**,**
- Comparing with your own culture – so called cultural dialogue,
- Learning by practice,
- Learning through experience, analysis and reflection.

Education of multicultural literacy is always on the process, because of the continues changes in the culture itself, and because of the deepness of its influence on person's behaviour and attitudes. And that why there is reason to continue developing of multicultural literacy in higher educational institutions.

It that constantly changing world no less important are the **self-directed learning competencies.** Self-directed learning in its broadest sense is the ability to manage one's own learning, i. the ability to become one's own teacher, the ability to create one's own learning story. And while it is likely that no adult learner would refuse such an offer, the question naturally arises as to whether every learner could, would be able to do so? Obviously, in order to become one's own learning guide, i. as a teacher, the learner must be able to manage their own learning process.

More specifically, should have self-directed learning abilities. The following self-directed learning abilities are most often distinguished (Knowles, 1983; Kazlauskienė, Gaučaitė, Pocevičienė, 2015, 2016; Pocevičienė, 2011, 2019):

- **Ability to analyze your knowledge in various fields and understand what you already know, are learning, are able to do and what more needs to be learned.** How this and other skills are useful in the aspect of self-directed learning will be discussed later by analyzing the issue of relevance of self-directed learning skills.
- **Ability to analyze one's learning process and oneself as a learner**, i. understand which personal qualities and abilities help and which hinder successful learning; what is the personal learning style and so on.
- **Ability to set our own learning goals and objectives**, even when working in a classroom, with others.
- **Ability to plan your learning time.**
- **Ability to choose appropriate and high-quality learning content**, even if it is routinely provided by a teacher or course leader.

- **Ability to manage information**, i. not only to find appropriate and reliable sources of information, to select the necessary material, but also to manage it, assess its completeness, reliability, accuracy, combine information obtained from different sources, and construct new knowledge, etc .;
    - **Ability to choose appropriate learning strategies, methods, tools, learning resources, environment, etc.**
    - **Ability to act purposefully to achieve the set tasks**, i. to link new learning materials with existing ones, to learn from experience and through experience, and so on.
    - **Ability to motivate oneself.**
    - **Ability to reflect**, i. to reflect on and / or evaluate their learning process and results in terms of set goals or other selected criteria, to identify the reasons for success and failure.
    - **Ability to anticipate opportunities and strategies for improving one's learning process.**

In summary, self-directed learning is learning in which the learner, even when learning together with others, is ready and able to independently set individual learning goals, adjust them according to need and / or situation, plan and organize their learning process, solve it during it. Problems of various kinds, to reflect on one's own learning experience and to evaluate the results obtained and the process itself, and to manage the further course of one's own learning process on the basis of those reflections and assessments. (Kazlauskienė, Masiliauskienė, Gaučaitė, Pocevičienė, 2010, 2013; Pocevičienė, 2011, 2014).

Research Method and Analysis of the Results. With the goal to identify the opportunities of multicultural literacy development in higher educational institutions the case study was done. The qualitative analysis based on of the experience of Siauliai State University of Applied Sciences in developing multicultural literacy and self-directed learning competencies of national and international students has been completed. Analysis of empirical data showed:
- how multicultural literacy and self-directed learning competencies could be developed in formal and non-formal education
- what are the positive factors as well as challenges and problems,
- How self-directed learning skills help here.

One of the possibilities to develop students' multicultural literacy is to involve the main ideas, principles, attitudes, and skills of multiculturality into the study programmes and other extra-curriculum activities. The opportunities of multicultural literacy self-directed learning competencies development in formal education are the following:
- **Study results in a study programme,** especially social or/and personal study results (for example, Working effectively and communicating in writing and orally in Lithuanian and foreign languages in an unfamiliar, changing, interdisciplinary environment. *Study Programme „Information Management")*
- **Study subjects (compulsory or/and optional) where English is the language of instruction** (for example, *International and Intercultural Communication in Study Programme „Office Administration", Changes Communication in Study Programme „Corporate Communication and Marketing, Entrepreneurship and Leadership in Study Programme „Office Administration")*
- **Introduction with a new culture** studying foreign languages (at least one or two foreign languages are studying in one study programme). Also in study subjects that are directly related with international and intercultural communication (for example, *International Marketing in Study Programme „Corporate Communication and Marketing" or International and Intercultural Communication in Study Programme „Office Administration")*
- **Topics in the study subjects**

- **Visiting professors from foreign higher educational institutions** (according to Erasmus+ programme, programme of Ministry of Education, Science and Sports in Lithuania or the programmes of municipalities)

A lot of different activities could be organized also in non-formal education:

- **Involving international students to the extra-curriculum activities in higher educational institution** (for example, Week of Adult Education, Students' Conferences, participating in seminars, round-table discussions, presentations of home culture, home university, city and etc.)
- **Introduction with a new culture**, especially if the cultures are more different than similar.
- **Meetings with other students** (with national students from the same study field or study programme, meetings with other foreign students studying in higher educational institution according all the programmes, meetings with students are going to go for their Erasmus+ studies abroad and etc.)
- **Joint activities of national and international students in the higher educational institution or outside and etc.**

All the activities – formal and non-formal – are organized keeping the main principles of teaching and learning. The most important principles for multicultural literacy are the following:

- Practical aspect and tasks,
- Experience based teaching/learning,
- Problem-based teaching/learning.

Conclusions and Discussion.

- Theoretical and empirical discourse analysis enables to distinguish some positive factors that could be the basis for more effective multicultural literacy education.
- The most important positive factors are the following: ability to overcome prejudices; more empathy and tolerance; productive, constructive participation in another culture and global world, better understanding your own and other cultures, openness for an unknown, different and untraditional, ability to communicate and act beyond your cultural boundaries and etc.
- On the other hand, development of multicultural literacy is not harmonic process. It means that it is necessary to continue it in all possible places, aspects and levels because it is obvious in the successful situation some challenges and problems rise.
- The challenges and problems that are needed to discussed are such as sometimes weak motivation of majority of students to participate in Erasmus+ or other programmes, self-directed learning competencies that could enable students to be more active and successful not only in multicultural education but in all kind of their studies; teachers' (professors') competences in self-directed learning/teaching as well as in internacionalization and multiculturality, lack empathy and tolerance in society; lack competences of some students (for example, reflection), lack experience being in another culture, close-mindedness and etc.

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