REFLECTIVE LEARNING IN CROSS-CULTURAL AND CROSS-DISCIPLINARY VIRTUAL CLASSROOMS

Melinda Dincă Daniel Lucheş Anca Luştrea

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PRESA UNIVERSITARĂ CLUJEANĂ

First author

Melinda Dincă

Co-authors

Daniel Lucheş Anca Luştrea

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Scientific reviewers:

Ioana Dârjan, *Ph.D*
Associate Professor at the Faculty of Sociology and Psychology, West University of Timișoara

Daniel Mara, *Ph.D*
Professor habil. at the Faculty of Social and Human Sciences, "Lucian Blaga" University of Sibiu

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Universitatea Babeș-Bolyai
Presa Universitară Clujeană
Director: Codruța Săcelean
Str. Hasdeu nr. 51
400371 Cluj-Napoca, România
Tel./fax: (+40)-264-597.401
E-mail: editura@editura.ubbcluj.ro
http://www.editura.ubbcluj.ro/

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The Reflective learning in cross-cultural and cross-disciplinary virtual classrooms was elaborated under the auspices of the project "Bringing Real Life into Virtual Classrooms" (EEA 21-COP-0004), implemented by the West University of Timisoara, Romania, in partnership with the Norwegian University of Science and Technology, Norway, under the EEA Financial Mechanism 2014-2021.

The book presents an analysis of the reflective practice of students who attended a joint course between UVT and NTNU, which involved experiential learning in transnational and cross-disciplinary groups of students. The students used digital and VR technologies to learn in a virtual environment.

This research inquiry supports innovation in higher education by developing teaching and learning methods suitable for virtual classrooms, facilitating common curriculum development for learning and teaching across distances, and contributing to the modernization of higher education by establishing closer relationships between partner universities and the world of work.

The "Bringing Real-Life into Virtual Classrooms" project achieved its goals through a co-teaching and co-learning process, which involved bringing the successful collaborative experience between UVT and NTNU from the pilot level to the development of best practices.

The project integrated a set of learning activities in a digital environment, with strong international, transferable, experiential, and cross-disciplinary dimensions, into the educational offer of partner universities.

The project team was formed and developed between 2018 and 2023 through a valuable collaborative partnership. An interdisciplinary team of researchers and teachers from UVT and NTNU shared their experiences and strengthened the co-creation process to jointly design, pilot, and implement transnational learning activities for higher education students.

The results of the "Reflective Learning in Cross-Cultural and Cross-Disciplinary Virtual Classrooms" research will be used to design curricula and innovate higher education learning activities by:

- Developing innovative practical solutions for learning in virtual classrooms, based on the use of digital tools, platforms, resources, and advanced technologies of virtual reality (VR, AR) for synchronic communication and collaboration across distance, focusing on digitalization of education.
- Jointly designing and organizing transnational learning activities truly integrated into the curricula of the partner universities, involving co-creation and co-teaching processes, and concluded with a mutually recognized certificate, ECTS, and mentioned in the graduated Diploma Supplement.
- Improving transversal competencies of the higher education students, which will increase their employability, with a strong inter-disciplinary component, based on the experiential, team-based and project-based learning methods. These transversal competencies are: reflective learning, communication, teamwork, cultural understanding of working relations, and digital skills.
- Reinforcing the partnerships between the universities' educational offer and the requirements of the world of work by bringing real-life cases from companies, NGO's, public institutions, and other social partners into the classrooms.

The *Reflective learning in cross-cultural and cross-disciplinary virtual classrooms* research team composition:

Anca Luştrea, Ph.D. in Educational Psychology, Assoc. Prof. at UVT. She is trainer in adults' education and principal supervisor psychologist

in special education. Her research interests are in special didactics, educational inclusion, and case management.

Atalia Oniţiu, Ph.D. in History, Assist. Prof. at UVT. Her research interests are in urban culture, sociology of religions, cultural heritage, quality of life and social policies for children with disabilities.

Daniel Lucheş, Ph.D. in Sociology, Assoc. Prof. at UVT. He is heading the UVT's Department of Scientific Research and Academic Innovation. His competencies are data analysis, research about migration and demographic aspects.

Håkon Fyhn, Ph.D., is a social anthropologist, Assoc. Prof. at NTNU. His area of interests is: robotisation and digitization, presence over distance, collaborative processes in working life, and control rooms operators in space.

Jens Røyrvik, Ph.D., Assoc. Prof. at NTNU. He is a specialist in innovative digital forms of team-based learning, and he is heading the research area of energy and environment, innovation, socio-technical perspectives on energy efficiency.

Mariana Craşovan, Ph.D. in Pedagogy, Assoc. Prof. at UVT. She is a specialist in teachers training on curriculum development, instructional design, and classroom management.

Marie Opdal Ulset. PhD Candidate, Department of Social Anthropology, Faculty of Social and Educational Sciences

Martin Thomassen, Ph.D in Social Anthropology, Assoc. Prof. at NTNU. His research has been on globalization and social inequality, mobility, subjectivity, and cultural heritage.

Melinda Dincă, Ph.D. in Sociology, Assoc. Prof. at UVT. Melinda has competencies in social inclusion through access to education and work integration, social identity, and team-based learning.

Tonje Victoria Lidahl Mørtsell. Researcher, Department of Social Anthropology, Faculty of Social and Educational Sciences

Trond Berge, Ph.D. in Social Anthropology, Assoc. Prof. at NTNU. Focus: resilience and vulnerability related to industrial pollution and its socio-cultural impact, social significance of work, disabilities, and racism.

The planning and design of the UVT-NTNU Joint Course Classroom Laboratory, including the course syllabus, lectures, and teaching methods, were drew upon the experiences, competencies, and characteristics of the research team members:

- Interdisciplinary composition.
- International teaching and learning previous experience.
- Team-based teaching and learning experience.
- Community-needs oriented topic of interest.
- Focus on technology-based learning and the growing interest in the digitalization of education current process.
- Common teaching objective in developing transferable competencies and future skills for students.

The Classroom Laboratory UVT-NTNU Joint Course setting:

- Synchronous techniques were used to determine real-time interactions between participants in the virtual classroom, with active involvement of students and teachers engaging in oral discussions, debates, formative assessment, reflective learning activities, and structured exercises.
- Encouraging students to work with open access learning materials, social databases, country reports, and open educational resources can increase the similarity between project-based learning and real-life work situations (Schneider & Prackel, 2017).
- Formative assessment was used to encourage self- and peer-reflection, self-regulation of time and task management, and for developing autonomous study and team-based learning.
- Bringing real-life professional cases to stimulate authentic and reflective practice among students.
- Team-based learning to increase the use of students' personal skills and educational backgrounds, as well as promote the development of transversal skills such as communication, collaboration in teams, and cultural understanding of work relations.
- The assessment process was designed to develop students' transferable competencies throughout the entire learning process. It is socio-culturally contextualized and situational, enabling students

to take an active role through self-assessment and reflective practice, as well as receiving feedback from peers and teachers.

- The expected learning outcomes for students in the UVT-NTNU Joint Course included practicing and developing transferable competencies such as reflective learning, communication, teamwork, cultural understanding, and digital skills.

PROBLEM STATEMENT

This study examines the impact of a reflective learning-based educational intervention on the development of transversal competencies in higher education students. Using a cross-cultural, cross-disciplinary Virtual Problem-based Learning approach, the longitudinal study analyzed student reflections at different stages of the course to better understand the development of skills such as teamwork, communication, digital competence, and cultural understanding. The findings suggest that incorporating reflective learning can enhance the development of these competencies and contribute to more student-centered teaching approaches in future curriculum designs. By creating collaborative, cross-disciplinary and cross-cultural learning settings, students can be better prepared to meet the professional and personal needs of the future labor market.

CONTEXT

Higher education institutions (HEIs) should strive to maintain high-quality standards to offer the labor market qualified specialists that meet its needs. They should also have knowledge of employability needs and future trends of the labor market and anticipate those needs through the proposed training programs (OECD, 2017). The curriculum and instructional strategies must include methods that contribute to the formation of professional and personal competencies necessary to train accomplished specialists.

Through research, HEIs should develop a curricular design based on empirical evidence to propose and train the specialists of the future (Healey et al., 2014).

The context of learning is an important variable that influences learning outcomes. To provide a current and modern learning experience that mimics today's working environment, we propose a cross-cultural and cross-disciplinary setting.

Students from various specializations and from various educational schools affiliated with universities from various educational systems make up a cross-disciplinary and cross-cultural group. The group's composition can vary in terms of age, educational level, area of expertise, and cultural background (Dincă et al., 2023). Mono-disciplinary groups, on the other hand, consist of students with the same specialization who work together to complete tasks and assignments within a specific timeframe. On the other hand, multidisciplinary or cross-disciplinary groups comprise individuals with diverse educational backgrounds and specializations (Schmidt et al., 2003; Seat & Lord, 2003; Shuman et al., 2005). Schaffer et al. (2012) defined a cross-disciplinary learning team as a social group of people who are diverse in terms of their knowledge, backgrounds, and experiences and who commit to a project over an extended period of time to address open-ended practical issues.

Cross-disciplinary learning involves a shift in team members' thinking from an individual to a collaborative approach (Schaffer, 2012), and it is closely linked to team dynamics, structure, and collaborative learning processes.

Working and learning in cross-disciplinary and cross-cultural groups, consisting of students from two different universities and countries with different educational systems and methods of instruction, as well as those with different specializations and backgrounds, can be more complicated.

Multicultural teams present both advantages and challenges. Regarding the benefits, we highlight the improvement of students' educational encounters (Lavy, 2017; Mittlemeier et al., 2018) and the creation of opportunities for exposure to novel concepts and ideals (Levin, 2005). However, these cross-cultural teams may also encounter obstacles related to communication through language (Montgomery, 2009), understanding cultural norms and interpersonal interactions, hierarchical relationships, teamwork, and institutional or cultural difficulties involving human factors (Fozdar & Volet, 2012).

In the previous research conducted by the Classroom Laboratory UVT-NTNU team (Dincă et al., 2021; Dincă et al., 2023) we aimed to find instructional solutions for designing a cross-cultural and cross-disciplinary course based on Virtual Problem-based Learning (VPBL) method, that will develop and enrich several fundamental transversal competencies for the tomorrow labor market: teamwork, collaboration, communication. Classroom Laboratory research also materialized in several analyzes and research reports on the topic of cross-

cutting transversal competencies and their teaching and evaluation methods (Berge et al., 2020; Dincă, 2022; Craşovan, 2022).

In the current study, we introduce a new dimension to our previous research: *reflective learning*. In the same context of VPBL, implemented in a cross-cultural and cross-disciplinary manner, we aim to develop and assess several transversal competences for the labor market of the future. In addition to teamwork, communication, collaboration, digital skills, and cultural understanding, we focused on reflective learning. To be competent and autonomous, a specialist in any domain should reflect on his performance and results (Lane & Roberts, 2022) and based on that reflection, should be capable of designing and managing future acts. Reflective learning adds a long-term competence that will raise the quality of the work's performance (Cattaneo & Motta, 2021).

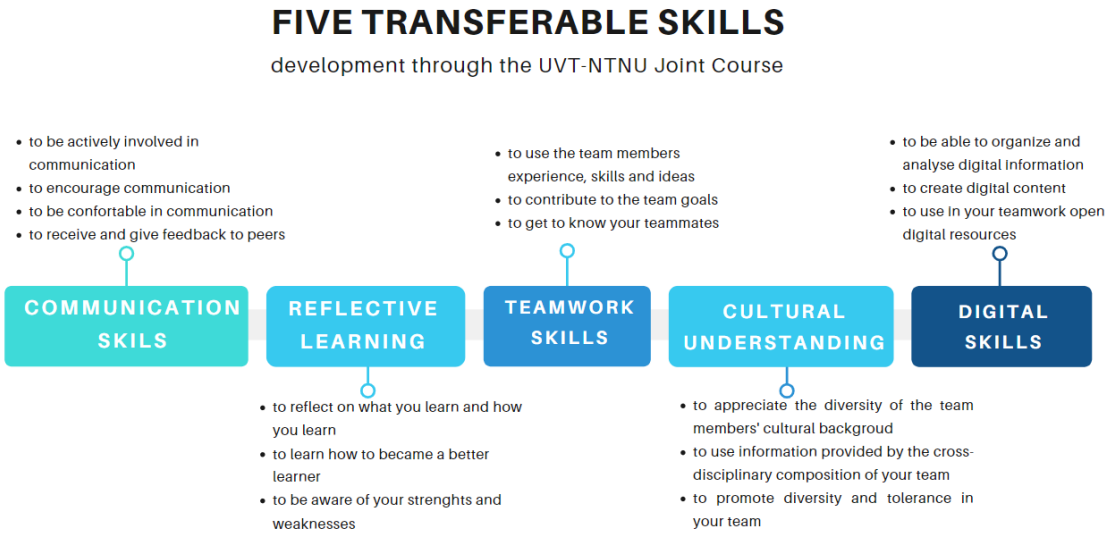


Figure 1. *Five transferable skills developed through the Classroom Laboratory UVT-NTNU Joint Course*

Figure 1 shows the five transferable skills that we aimed to practice and develop for students attending at the Classrooms Laboratory UVT-NTNU joint course.

There are various **communication skills**, which can be integrated under the umbrella term of effective communication. These skills include active

engagement in communication, encouragement of communication, comfort with communication, and the ability to receive and provide feedback.

Effective communication skills are crucial for both personal and professional activities. Only through effective communication can individuals interact and collaborate to communicate their needs, intentions, ideas, interpretations, understanding, consensus, and progress.

Communication skill development starts early in life and requires continuous improvement. At the university level, students need to develop their communication skills in teams, workplaces, and virtual environments. The Classroom Laboratory UVT-NTNU Joint Course approach offers real employment contexts that allow students to capitalize on their communication skills and apply them in future employment settings.

Reflective learning refers to the process of reviewing and reflecting on one's learning to better understand the strengths and weaknesses of the self-directed learning process. The goal of reflection is for individuals to improve their learning skills and outcomes for the future.

Through the internal process of analyzing strengths and identifying potential areas for growth, reflective learning aims to foster the development of critical thinking abilities. It supports shifts in conceptual viewpoints, allowing students to construct and clarify meaning in terms of their own comprehension and cognition.

Reflective learning requires individuals to become more aware of their learning process. By asking questions and engaging in critical thought regarding their own ideas, it encourages students to become more engaged learners and improve their critical thinking abilities.

Teamwork skills include leveraging the learning and experience of all team members, working together towards a common goal, and having a deep understanding of each team member's strengths and weaknesses.

Universities are increasingly incorporating teamwork skills into their curricula as they are considered essential for personal, academic, and career success. In an increasingly globalized, dynamic, and complex world, teamwork skills are becoming more crucial. Strong teamwork abilities are key to working effectively with others. Employers value candidates with strong teamwork skills because they demonstrate leadership, collaboration, and effective communication. Employers look for team players in their employees. Almost

every sector, from business solutions to information technology to culinary services, requires teamwork.

Cultural understanding skills refer to the acceptance and valorization of teammates' cultural backgrounds, as well as tolerance and acceptance of diversity.

Cultural competence is the ability to communicate, collaborate, and build strong relationships with individuals from various cultural backgrounds. Cultural background encompasses values, traditions, and behaviors of people from different groups. To acquire cultural competence, one must develop social skills and behaviors around diversity, increase their self-awareness, and gain the ability to speak up for others. It goes beyond mere tolerance, which implies that one is willing to overlook differences. Instead, it involves recognizing and respecting diversity in all situations through our words and actions. As societies become more ethnically diverse and globalized, intercultural communication breakdowns, biases, and issues with inequality still exist. With remote and online working becoming increasingly prevalent, developing these skills is essential in a globalized society.

Digital skills include the ability to select and use digital information, create digital content, and work collaboratively using open learning resources.

Digital skills refer to the ability to find, evaluate, use, share, and produce content on digital devices such as computers and smartphones. In today's workplace, companies expect their employees to possess advanced digital skills. As our lives increasingly depend on the internet and digital interactions, it is important to keep up with the changing skill requirements. Having digital skills sets us apart from our peers and colleagues and increases our chances of finding employment in any field.

Developing fundamental digital skills is the first step in acquiring many other new skills. It boosts one's confidence in using technology for work, education, and daily life. Today, most jobs require some level of digital proficiency, even those that do not require specialized training or expertise. In addition, digital skills are essential for working collaboratively with others and using open learning resources.

WHY DOES IT MATTER?

To gain a comprehensive understanding of how transversal competencies are developed in a digital, cross-cultural, and cross-disciplinary learning context, a longitudinal approach is necessary. Students were asked to reflect on their learning experiences in VPBL teams three times throughout the course: at the beginning, middle, and end. Examining the students' perspectives on the challenges and benefits of learning in such an innovative setting can inform the development of a more student-centered teaching approach in future curriculum designs.

PURPOSE

The main objective of this study was to examine how a reflective learning-based educational intervention, implemented through a cross-cultural, cross-disciplinary Virtual Problem-based Learning (VPBL) approach, impacts the development of students' transversal skills. The research focuses on identifying the role of reflective learning in developing skills such as teamwork, communication, digital competence, and cultural understanding. The findings are expected to contribute to a better understanding of the need for creating cross-cultural and cross-disciplinary learning contexts that meet students' actual professional and personal developmental needs, beyond the requirements of the higher education curriculum and labor market demands. By involving students in the assessment process, the study also aims to empower them to co-design their own educational path.

RESEARCH
DESIGN

This study investigated the impact of reflective learning on the development of students' transversal competencies in a cross-cultural and cross-disciplinary Virtual Problem-based Learning (VPBL) setting. A quasi-experimental between-subjects study design was used, and data were collected longitudinally through two quantitative questionnaires and qualitative content analysis of students' reflections at three different stages of the course. The study employed a mixed-methods approach to gain a comprehensive understanding of the impact of reflective learning-based educational interventions. The research was conducted with 69 Romanian and Norwegian students who participated in the Classroom Laboratory UVT-NTNU Joint Course, designed to be interdisciplinary and cross-cultural. The course employed a Project-based Virtual Learning (PBVL) approach and incorporated advanced technologies, such as Virtual Reality, and various online communication and collaboration tools. The results indicated that reflective learning can foster the development of students' cross-cultural communication, teamwork, digital, and cultural competencies in a VPBL setting.

To gain a better insight into the impact of reflective learning in a VPBL cross-cultural and cross-disciplinary method on development of students` transversal competencies, a mixed methodology was used. This study applied a quasi-experimental between-subjects study design.

The present study was designed longitudinally to assess students' transversal competencies and their perspectives on learning at three different stages of the course, namely the team-building phase (T1), teamwork phase (T2), and team performance phase (T3). To evaluate the transversal competencies, two questionnaires were administered using quantitative methods during the three research times. In addition, qualitative content analysis was used to analyze students' reflections on the group learning experience and to provide a better understanding of the quantitative results.

The study employed a mixed-method research approach to allow triangulation of survey data and open-ended questions and to analyze the findings by a multidisciplinary research team. The use of mixed-methods approach allowed for a more comprehensive and detailed understanding of the impact of the reflective learning-based educational intervention on students' transversal competencies in the cross-cultural and cross-disciplinary Virtual Problem-based Learning (VPBL) setting.

RESEARCH QUESTION

This research was conducted in the Classroom Laboratory UVT-NTNU Joint course, where students participated in Romanian-Norwegian cross-disciplinary study groups and learned using digital and advanced technology, including VR, to communicate and collaborate at a distance. The students worked in project-based teams and collaborated with teachers, researchers, and local experts to develop their skills and professional competencies.

The aim of the study was to investigate the impact of an educational intervention based on reflective learning. To achieve this, students from the West University of Timişoara (UVT) and the Norwegian University of Science and Technology (NTNU) who were attending the UVT-NTNU Joint Course reflected on their learning experiences in problem-based teamwork. The study used mixed-method research, including quantitative questionnaires and qualitative content analysis, to triangulate the data and analyze the findings by a multidisciplinary research team. The learning activities were designed to allow students to collaborate in real-time and search for practical solutions to social and work integration problems faced by vulnerable individuals in their everyday lives.

RESEARCH QUESTION	**Which are the benefits and challenges** of reflective learning in a cross-cultural, cross-disciplinary setting on the development of students` transversal competences**?**

RESEARCH OBJECTIVES

OBJECTIVE 1 To identify the significant benefits and challenges for the students learning in cross-cultural and cross-disciplinary study groups

OBJECTIVE 2 To measure the self-perceived level of competence for the students involved in cross-cultural VPBL

OBJECTIVE 3 To assess the transversal competencies (reflective learning, teamwork, communication, cultural understanding and digital skills)

OBJECTIVE 4 To measure the creative tension (between the start and the end of the Classroom Laboratory UVT-NTNU Joint Course)

OBJECTIVE 5 To evaluate the impact of the reflective learning in developing the transferable competences

OBJECTIVE 6 To identify the effects of cultural belonging in the reflective learning process (NTNU Norwegian students vs. UVT Romanian students)

OBJECTIVE 7 To identify the differences in students self-assessment of transferable competences by field of study (STEM vs. Non-STEM)

OBJECTIVE 8 To identify the differences in students self-assessment of transferable competences by gender

HYPOTHESES

The educational intervention based on reflective learning in a cross-cultural, cross-disciplinary VPBL instructional method determines the significant increase of students` transferable skills (communication, teamwork, reflective learning, cultural understanding, and digital skills).

HYPOTHESIS 1 The self-perceived level of transferable competences in the initial stage differs by university and cultural background (NTNU Norwegian vs. UVT Romanian)

HYPOTHESIS 2 The self-perceived level of transferable competences in the final stage differs by university and cultural background (NTNU Norwegian vs. UVT Romanian)

HYPOTHESIS 3 The dynamic of the development of transferable skills differs by university and cultural background (NTNU Norwegian vs. UVT Romanian)

HYPOTHESIS 4 The dynamic of the development of transferable skills differs by field of study (STEM vs. non-STEM).

HYPOTHESIS 5 The dynamic of the development of transferable skills differs by students` gender.

RESEARCH INSTRUMENTS

The UVT-NTNU teachers collaborated in designing and implementing reflective practice using specific tools such as reflective journals, self-assessment questionnaires, creative tension questionnaires, feedback from instructors, and feedback from peers to facilitate reflective learning among students (adapted from Loo & Thrope, 2002; Wu et al., 2021; Ferris et al., 2005; Achcaoucaou et al., 2012; Griffin et al., 2012; Imran & Kantola, 2018, p. 288). Two research instruments were developed, tested, and utilized to gather students' self-assessments and reflections on team-based learning activities in the cross-disciplinary and cross-cultural learning environment of the Classroom Laboratory UVT-NTNU Joint Course.

The Self-Assessment Questionnaire consists of a 19-item 5-point Likert scale instrument designed to assess five transferable skills, each corresponding to a factor: reflective learning, teamwork, communication, digital skills, and cultural understanding. Factor 1, reflective learning (4 items), evaluates students' reflection on how they learn (e.g. ""I reflect on how I learn""); Factor 2, teamwork (5 items), assesses the extent to which students know how to work

in teams (e.g. “I get to know and trust my team members”); Factor 3, communication (5 items), measures students' ability to effectively communicate in teams (e.g. “_I respond and give feedback to other”); Factor 4, cultural understanding (5 items), examines the degree to which students can adapt to a diverse environment, in terms of culture, ethnicity (e.g. “I work better in a diverse team”); and Factor 5, digital skills (6 items), evaluates students' level of skills in using digital tools (e.g. “I would like to see an increased use of digital”).

The Creative Tension Questionnaire consists of a 15-item 5-point Likert scale instrument designed to assess five transferable skills, each corresponding to a factor: reflective learning, teamwork, communication, digital skills, and cultural understanding. Each scale includes three questions, with the first addressing the importance of the skill, the second evaluating the perceived level of competence, and the third assessing the respondent's target for developing the skill. For example, one item in the questionnaire asks, “My target digital skills level is (aim to achieve).”

COLLECTING AND PROCESSING DATA

Currently, educators and curriculum designers in higher education institutions (HEIs) are proposing various learning activities aimed at enhancing students' reflective skills through exercises, role-playing, formative feedback, and similar approaches. The primary objective of these reflective practices is to facilitate students in comprehending the connections between classroom learning and its application in their professional and lifelong learning endeavors, to clarify learning objectives, and to emphasize the significance of the learning process as opposed to mere grades. The Classroom Laboratory UVT-NTNU Joint Course was designed to expose students to reflective learning practices.

As part of the course requirements, students were expected to engage in reflective learning activities and utilize the suggested reflective learning tools repeatedly throughout the learning process. These activities were conducted

longitudinally to ensure that students were able to gain a deeper understanding of the learning objectives and the significance of reflective practices.

- The Self-Assessment Questionnaire comprising scales and an open-ended question (i.e., reflective journal) was administered three times throughout the course, following each team-based learning phase. Specifically, the questionnaire was administered at the conclusion of the first team-based learning session, corresponding with the Teambuilding phase (T1); after the second learning phase, corresponding with the Teamwork phase (T2); and at the end of the UVT-NTNU joint course, corresponding with the Team Performance phase (T3).
- The Creative Tension Questionnaire was administered twice during the course, once before the first team-based learning activity and again at the end of the UVT-NTNU joint course. These assessments were conducted to measure pre-test and post-test responses.

Students were instructed to utilize the reflective learning tools under the following conditions:

- They were encouraged by the course instructors and teaching assistants to reflect on their experiences from the previous learning phase in the UVT-NTNU joint course.
- They were given a maximum of 30 minutes to complete the questionnaire at the end of the lecture. During the instrument testing phase, students typically required an average of 12 minutes to complete the Self-assessment questionnaire and 3 minutes to complete the Creative Tension questionnaire.
- The Self-assessment questionnaire included an open-ended question, referred to as the "Reflective journal," allowing students to respond in either English, which was the language of instruction for the UVT-NTNU joint course, or their mother tongue, thereby eliminating language barriers that might impede their ability to express their personal reflections.
- Both reflective tools were administered online, utilizing Google Form questionnaires, as depicted in Figure 2.

- Data collection took place during the period of October to November 2022, coinciding with the learning activities in the Classroom Laboratory UVT-NTNU Joint Course, in the first semester of the academic year 2022-2023.

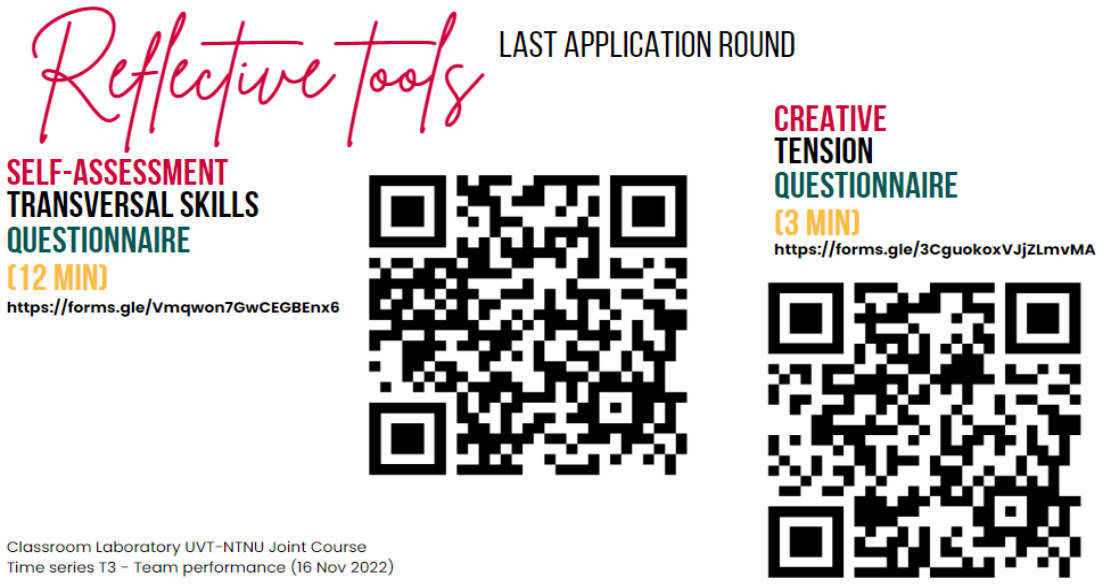


Figure 2. *Reflective tools administration*

Following the completion of each reflective tool, the course instructors provide group feedback to the students (as shown in Figure 3). The teachers and students discuss the preliminary results of the data obtained from the previous learning phase questionnaires and encourage students to take an active role in reflective learning by becoming directly involved in specific activities, such as providing peer-to-peer feedback, monitoring, evaluating, and making necessary corrections.

The collected data was subjected to mixed quantitative and qualitative analysis techniques, which included descriptive statistics, comparison of sample groups, content analysis, and hermeneutic interpretation. Specific software packages were utilized for these analyses, including SPSS for quantitative analysis and MAXQDA for mixed quantitative and qualitative analysis.

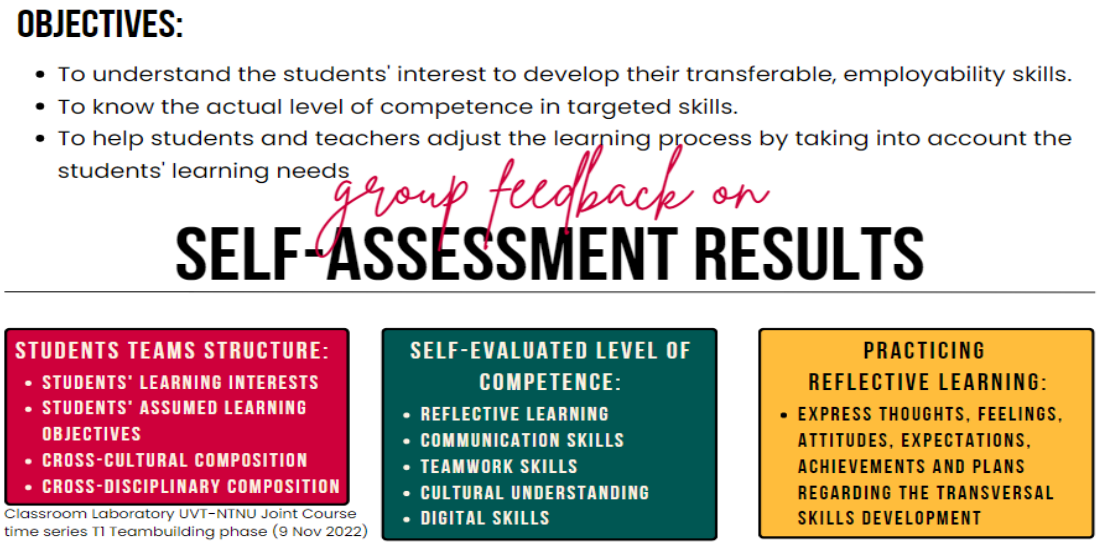


Figure 3. *Group feedback on the results of the research instruments administered at the end of the first learning phase, T1 - Team Building*

RESEARCH PARTICIPANTS

Data were collected from a convenience sample consisting of 69 Romanian and Norwegian students who were enrolled in the Classroom Laboratory UVT-NTNU Joint Course (as shown in Table 1). The age of the participants ranged from 19 to 57 years, with a mean age of 23.35 years and a standard deviation of 5.50.

Of the total sample, the majority of participants were female (53.6%).

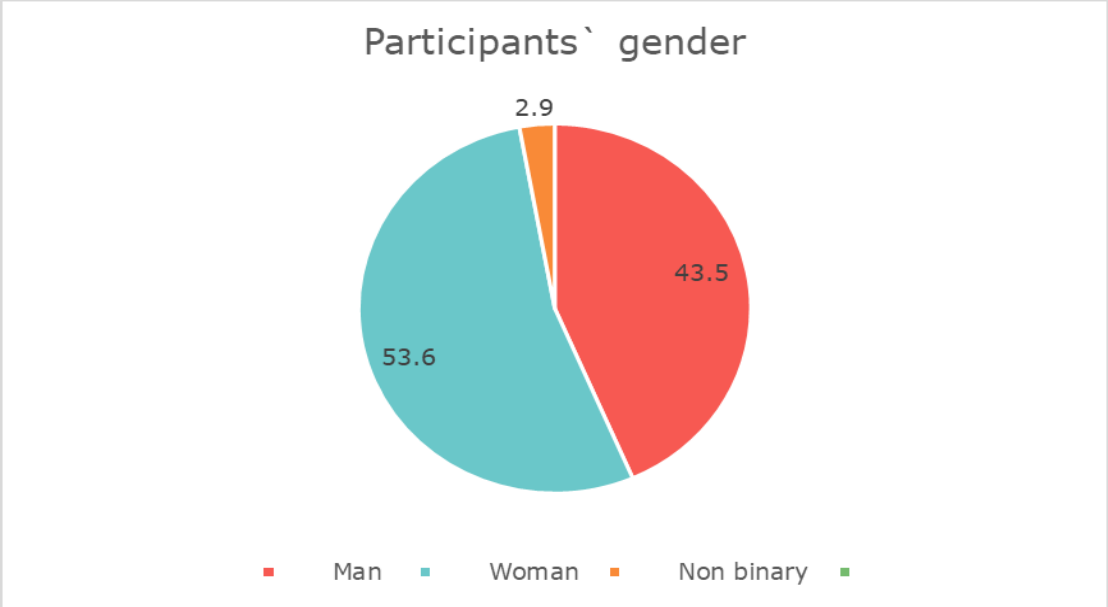


Figure 4*. Classroom Laboratory UVT-NTNU Joint Course participants by gender*

37 students (53.6%) were enrolled at NTNU and 32 students (46.4%) at UVT.

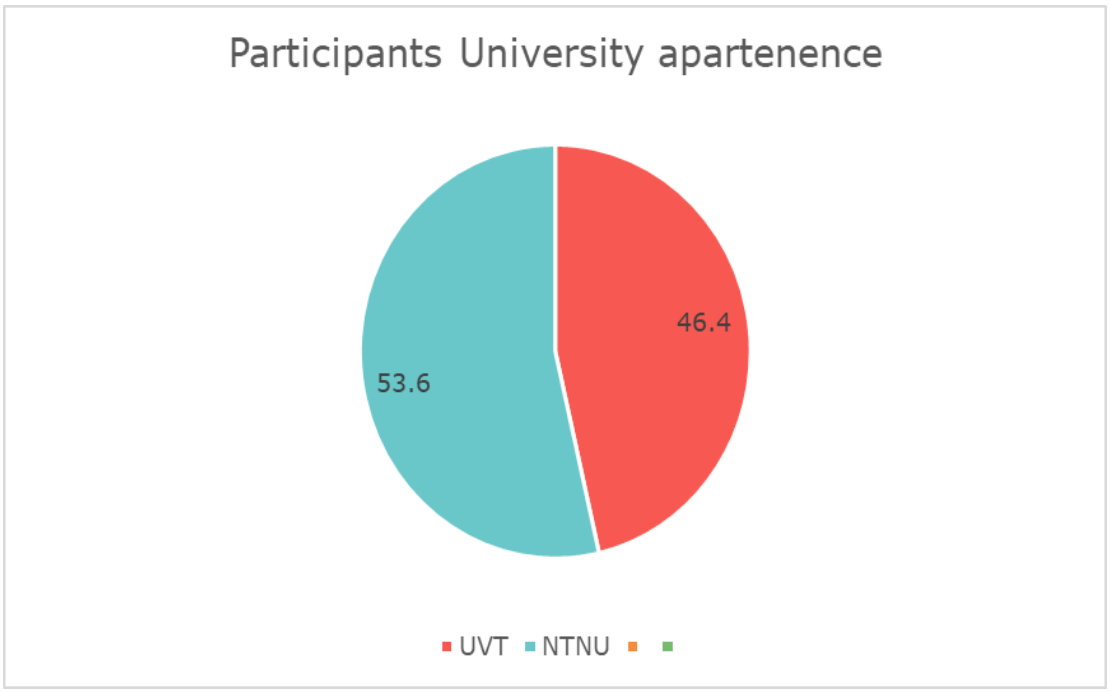


***Figure 5**. Classroom Laboratory UVT-NTNU Joint Course participants by university*

The majority (75.4%) studied at the bachelor level.

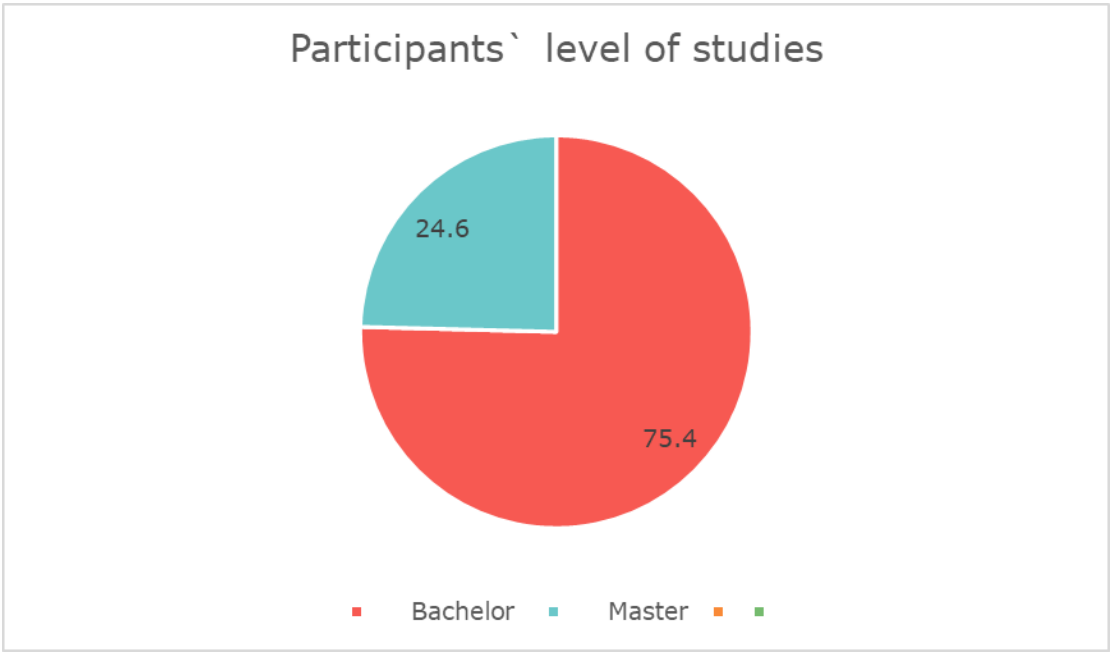


***Figure 6**. Classroom Laboratory UVT-NTNU Joint Course participants by level of study*

Study participants by the field of study, STEM sciences (53.6%) and 46.4 % nonSTEM.

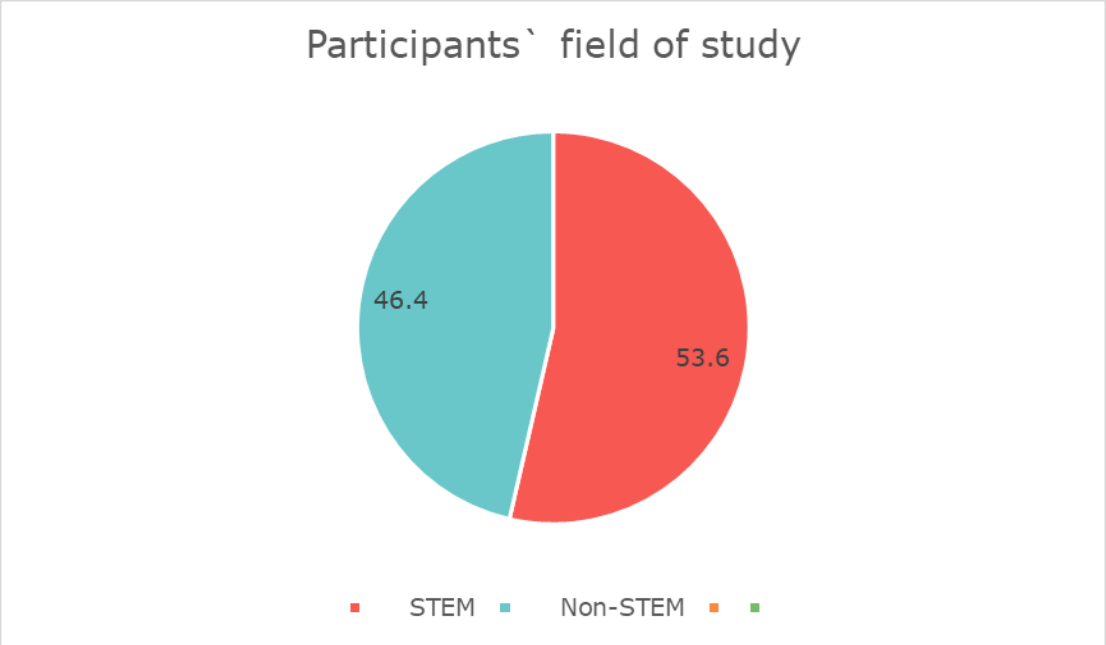


Figure 7. *Classroom Laboratory UVT-NTNU Joint Course participants by field of study in technology and engineering, mathematics and computer science (STEM) or in social sciences, education sciences, humanities and arts (non-STEM)*

Table 1. *Descriptive summary of the participants (both UVT and NTNU)*

Category	Frequency	%
Gender		
Man	30	43.5
Woman	37	53.6
Non binary	2	2.9
University		
UVT	32	46.4
NTNU	37	53.6
Level of studies		
Bachelor	52	75.4
Master	17	24.6
Field of study		
STEM	37	53.6
Non-STEM	32	46.4

Among the 37 students from NTNU, the age range was 21 to 57 years, with a mean age of 24.16 years and a standard deviation of 5.98. The majority of the participants from NTNU were male (62.2%).

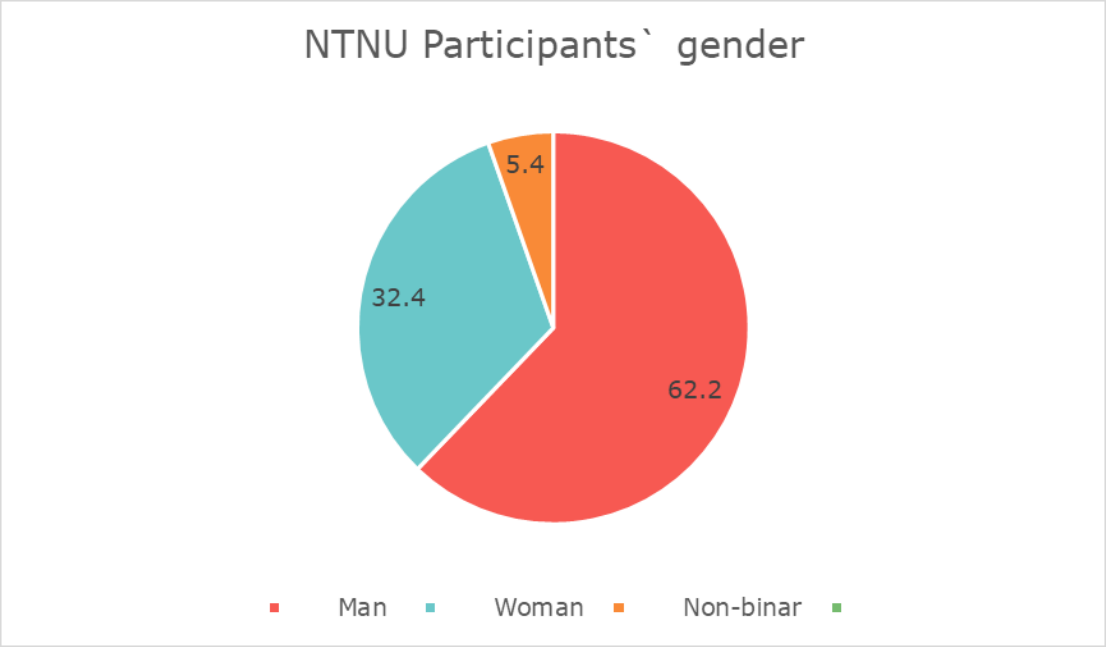


***Figure 8**. NTNU participants by gender*

The majority (64.9%) studied at the bachelor level.

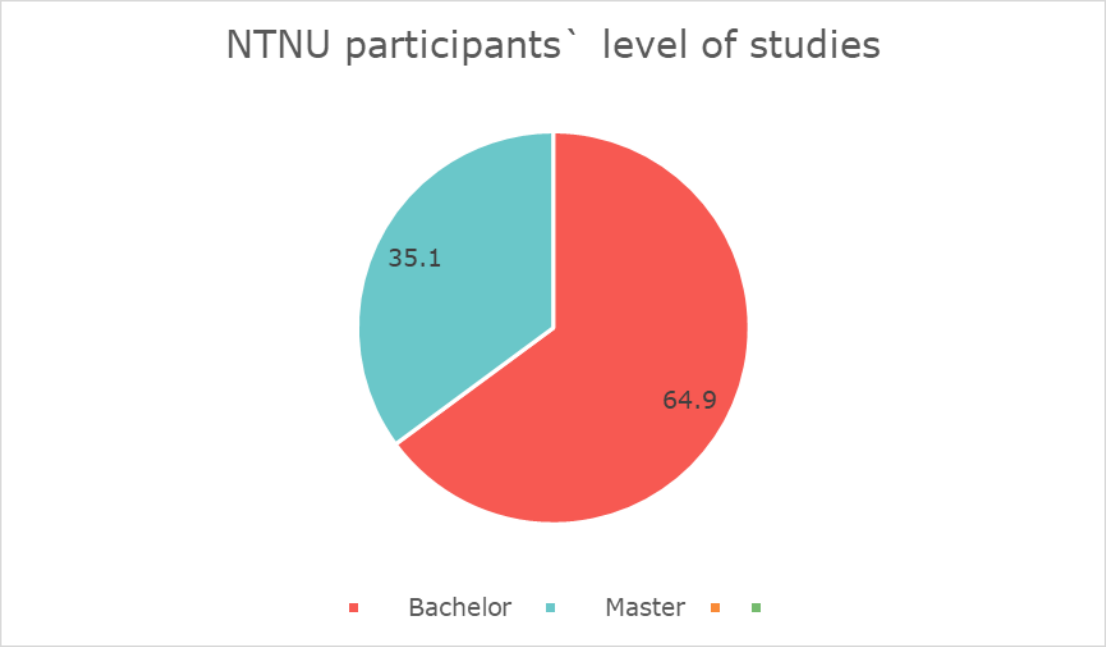


***Figure 9**. NTNU participants by level of studies*

The majority of NTNU students studied STEM sciences (94.6%) (Table 2).

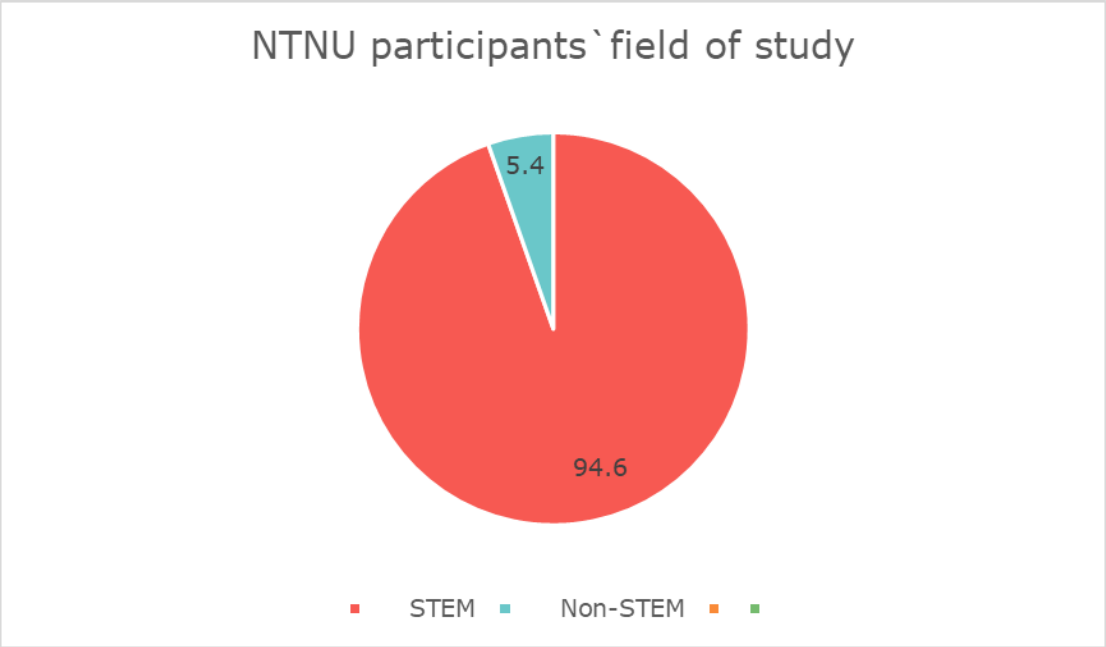


Figure 10. *NTNU participants by field of studies*

Table 2. *Descriptive summary of the participants (NTNU students)*

Category	Frequency	%
Gender		
Man	23	62.2
Woman	12	32.4
Non-binary	2	5.4
Level of studies		
Bachelor	24	64.9
Master	13	35.1
Field of study		
STEM	35	94.6
Non-STEM	2	5.4

Among the 32 students from UVT, the age range was 19 to 41 years, with a mean age of 22.41 years and a standard deviation of 4.79. The majority of the participants from UVT were female (78.1%).

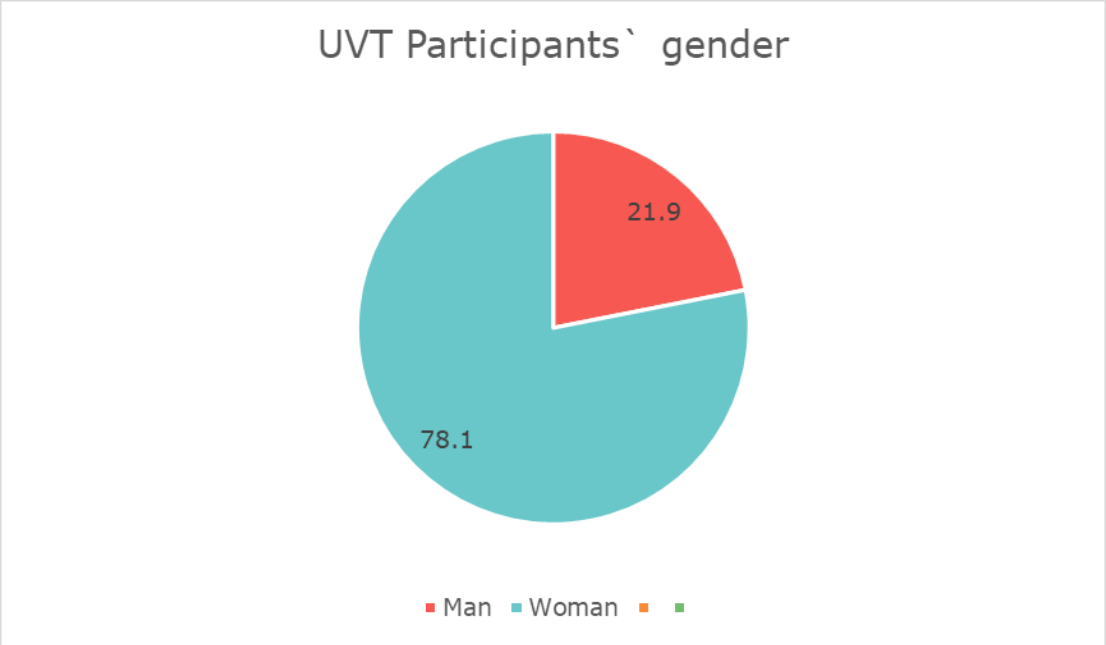


***Figure 11**. UVT participants by gender*

The majority (87.5%) studied at the bachelor level.

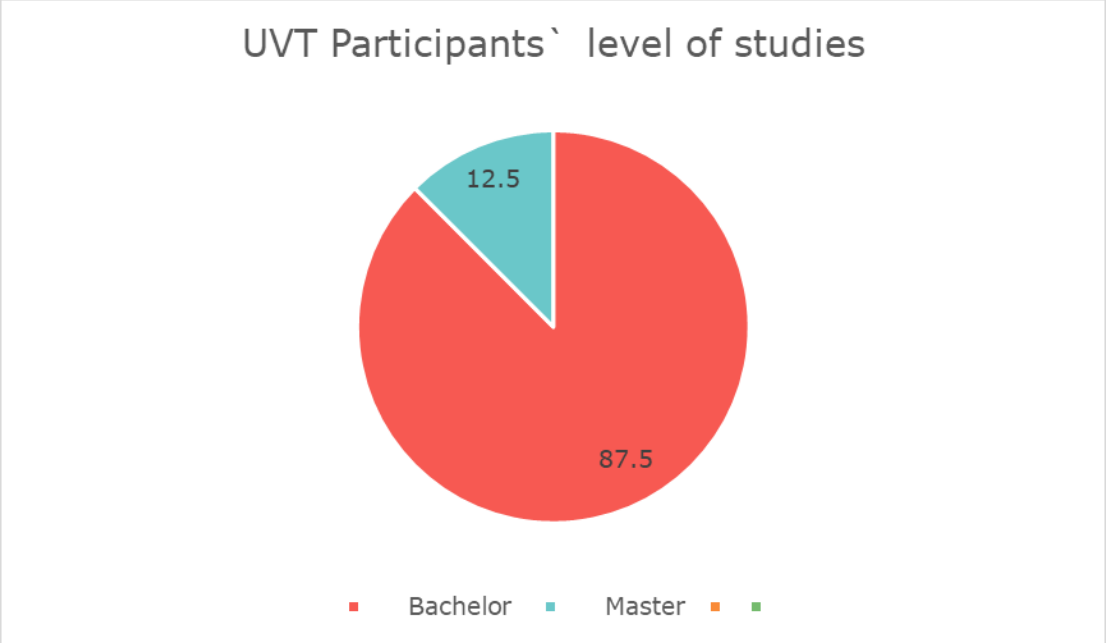


***Figure 12**. UVT participants by level of studies*

The majority studied non-STEM sciences (93.7%) (Table 3).

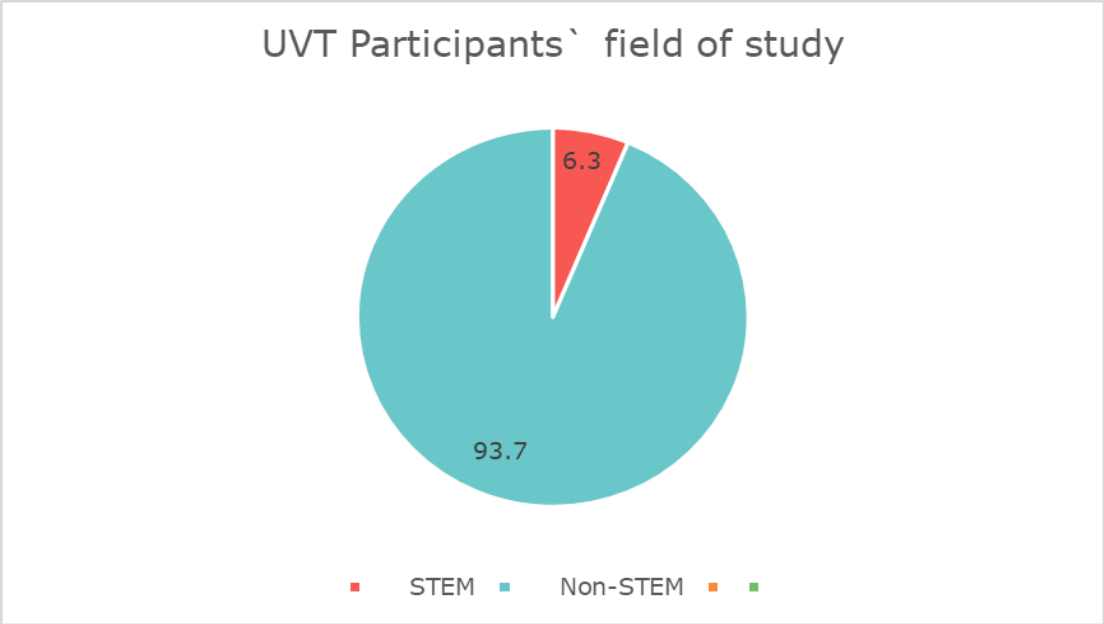


Figure 13. *UVT participants by field of studies*

Table 3. *Descriptive summary of the participants (UVT students)*

Category	Frequency	%
Gender		
Man	7	21.9
Woman	25	78.1
Level of studies		
Bachelor	28	87.5
Master	4	12.5
Field of study		
STEM	2	6.3
Non-STEM	30	93.7

SOURCE DOCUMENTS – REFLECTIVE JOURNAL

„Reflective journal open-ended question:

Take a few minutes to reflect on your activity related to the Classroom Laboratory NTNU-UVT Joint Course.

Express in approximately 250 words your thoughts, feelings, attitudes, expectations, achievements, and plans regarding your skills development at the Classroom Laboratory NTNU-UVT Joint Course.

(Please write your response in English, Norwegian or Romanian language)"

A total of 142 source documents were collected from the students' responses to the reflective journal question. Of these, 127 were validated and used in the subsequent content analysis. The remaining 15 source documents were excluded due to their lack of meaningful content or high level of generality and ambiguity.

The text-documents in Romanian and Norwegian were initially translated and adapted into English before being analyzed. The validated responses were then organized and structured for thematic content analysis.

The resulting text-documents were read and analyzed hermeneutically, and then thematically organized into categories of meaning, with codes, sub-codes, and memos allocated for further analysis and interpretation.

The present study involved the analysis of students' responses to the reflective journal question, which resulted in 127 validated source-documents that were used in the content analysis. The 15 invalidated source-documents were excluded due to their meaningless or highly ambiguous content.

To analyze the responses, the thematic meaning categories were derived from the students' reflections on the five competences, namely reflective learning, communication, teamwork, cultural understanding, and digital skills. Furthermore, the students' responses revealed a new code - feelings - which encompassed emotions expressed by the students associated with their participation in transnational team-based learning activities within the Classroom Laboratory UVT-NTNU Joint Course. A relations analysis (qualitative-quantitative mixed method, similar to the statistical contingency tests) was carried out between the codes and documents, disaggregated data by the *cross-disciplinary* and *cross-cultural* composition of students groups on the students' responses at the open-ended question "Reflective journal". The

variables: "STEM/ non-STEM" reflecting the study program, variable "VR/ non-VR" reflecting the use of virtual reality technology in the team-based learning activities, and the variable "UVT/ NTNU" reflecting the students' cultural background, Romanian and Norwegian.

T1 T2 T3

Figure 14. *Word clouds from the students responses at the Reflective journal, extracted in three different phases of the learning process:*
Teambuilding (T1), Teamwork (T2) and Team performance (T3)

During the document-text processing, the frequency dynamics of certain lemmatized words at the end of each learning stage, denoted by T1, T2, and T3, were also considered. The analysis revealed that the students' attention shifted from the centrality of interpersonal relationships in the transnational context to result orientation, project development, and teamwork. Figure 14 illustrates the most frequently used words by the students, such as work, project, people, learn, think, student, course, team, and communicate, which were highlighted based on their size and centrality.

For the 127 validated source-documents, 958 text fragments encoded with 6 parent codes and 65 subcodes were obtained (see Figure 15, Figure 16 and Figure 17).

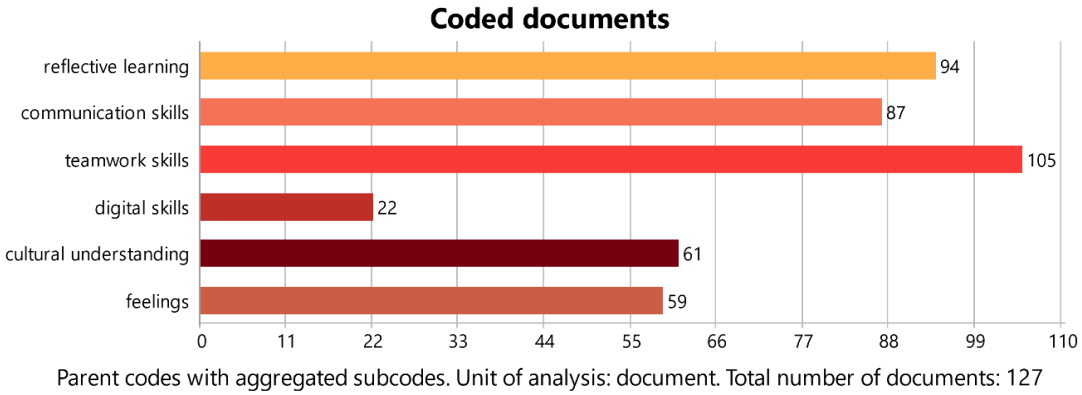


Figure 15. *Coded documents – Reflective journal*

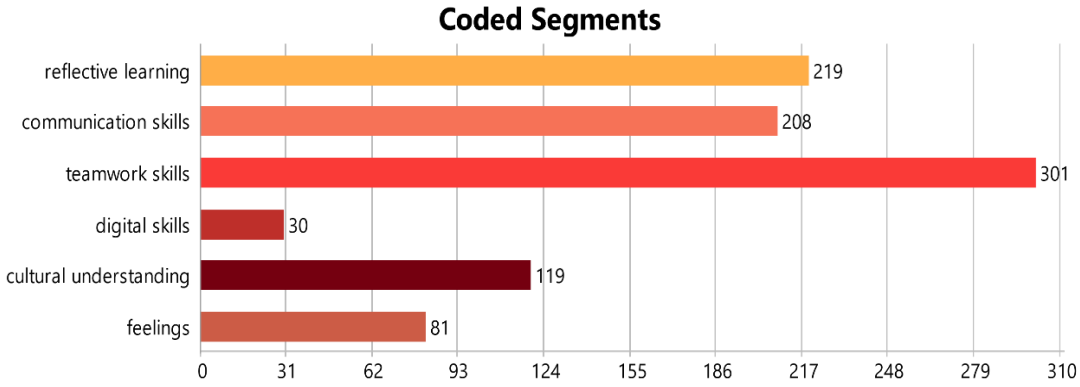
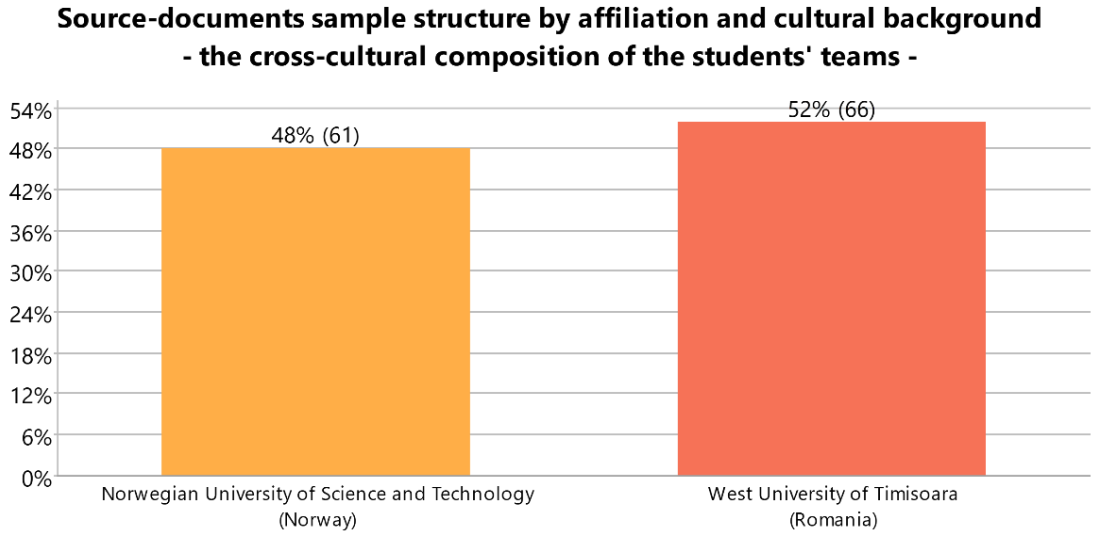
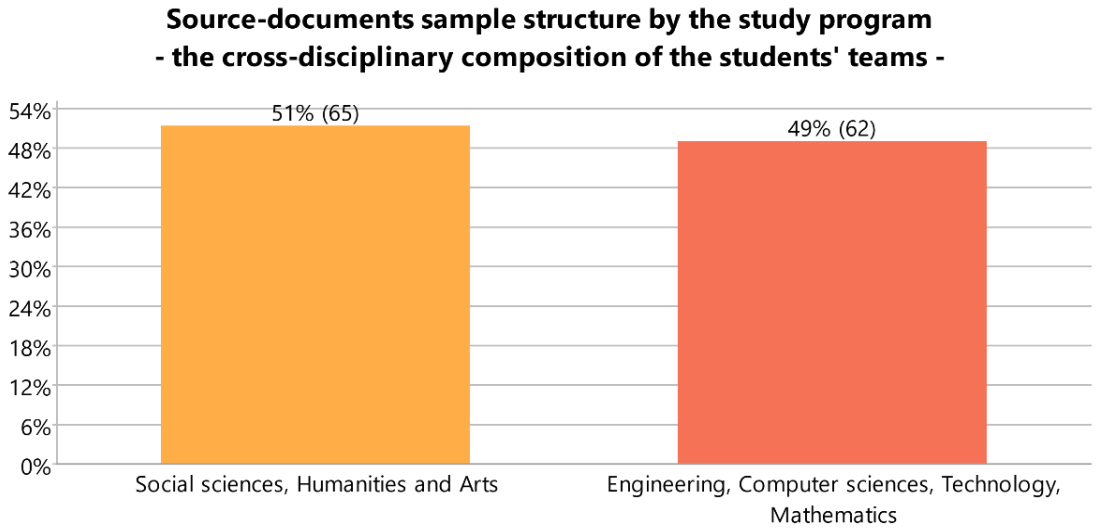


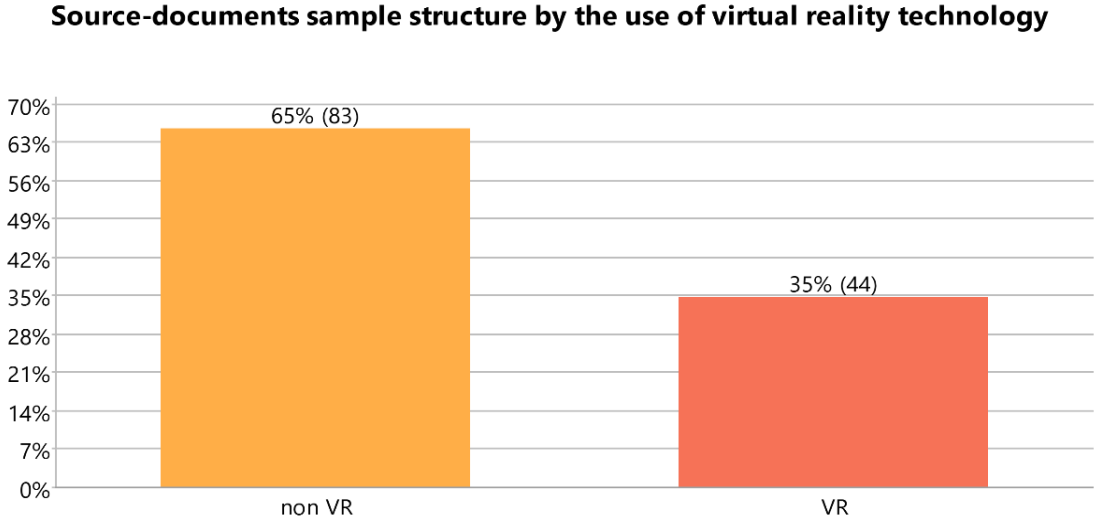
Figure 16. *Coded fragments – Reflective journal*

Figure 17. *Subcodes could – Reflective journal*
Unit of analysis: subcodes. The most frequent codes are vertically-centered and larger.

The source-document sample structure is described in Figure 18.







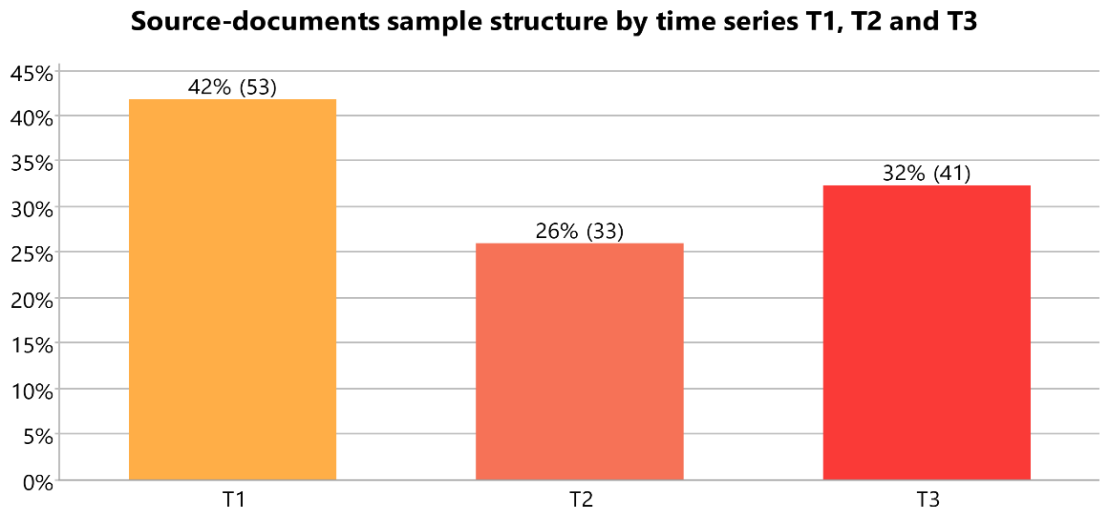


Figure 18. *Source-documents sample structure, by affiliation and cultural background, study program, use of the virtual reality technology, and time series*

To assess the impact of cross-cultural, cross-disciplinary composition, and the integration of VR technology on students' reflective journal responses, the normality of the distribution of codes and subcodes across independent samples was evaluated. The results of the t-test for independent samples indicate a normal distribution of codes and subcodes across all analyzed groups of source-documents.

THE EDUCATIONAL INTERVENTION

The present research utilized a quasi-experimental between-subjects design to investigate the impact of a cross-cultural and cross-disciplinary virtual learning environment on students' transversal competencies. Specifically, the Classroom Laboratory UVT-NTNU Joint Course was designed to be cross-disciplinary, as the participating students represented diverse fields of study, including STEM and non-STEM, and cross-cultural, as students were enrolled at two universities located in different countries, Romania and Norway. The course employed a Project-based Virtual Learning (PBVL) approach, where students collaborated in heterogeneous teams to identify solutions to social problems and promote work integration of vulnerable groups. The virtual learning environment incorporated advanced technologies, such as Virtual Reality (VR), and various online communication and collaboration tools. The primary objective was to foster reflective learning

in transnational and cross-disciplinary teams, with an emphasis on developing students' cross-cultural communication, teamwork, digital, and cultural understanding of work-life relations and reflective learning competencies.

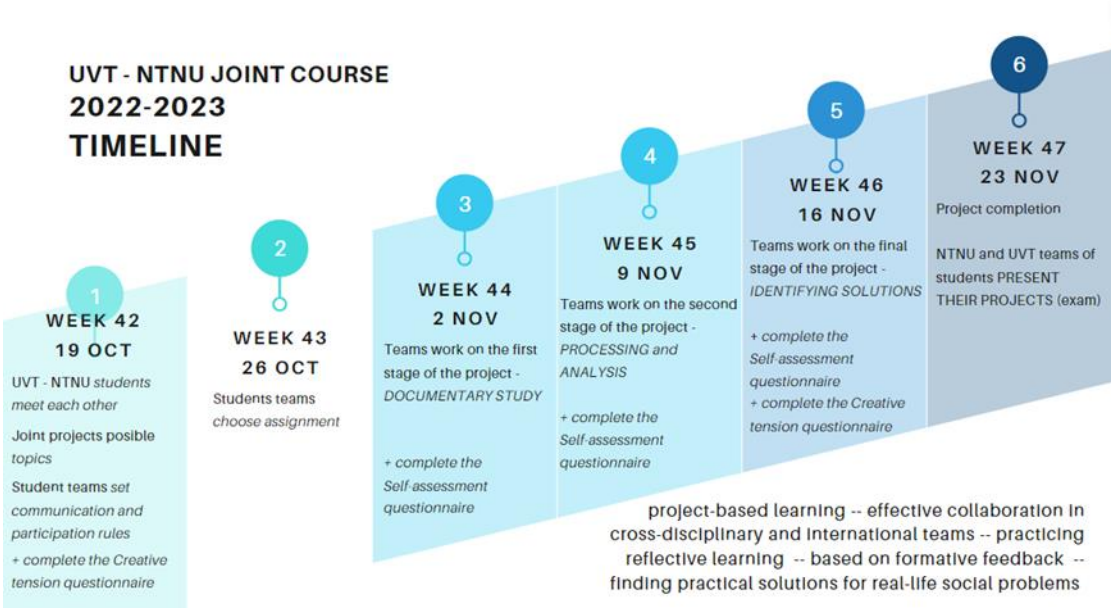


Figure 19. *The timeline of the UVT-NTNU Joint Course*

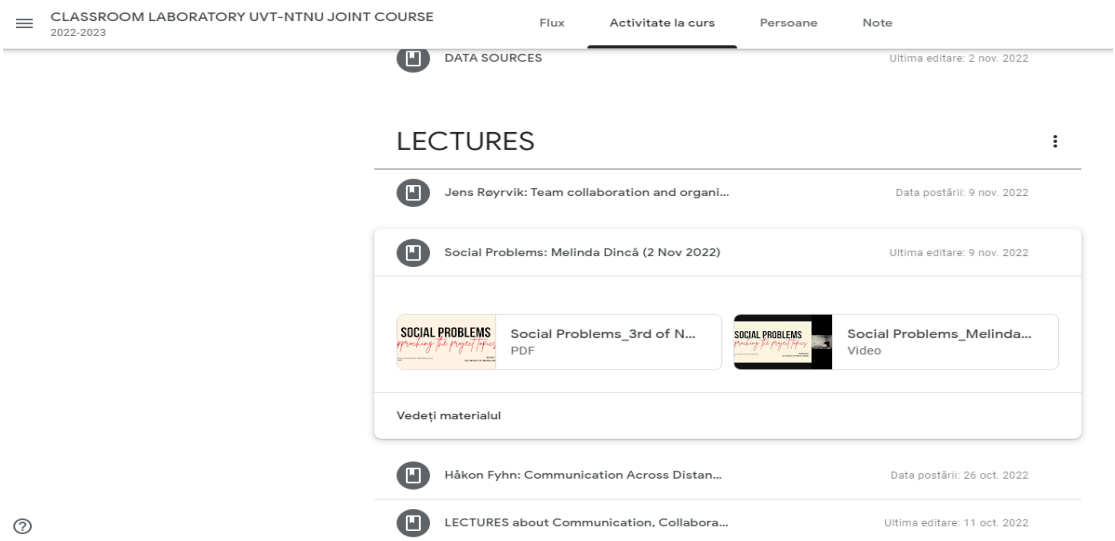
In the above presented Figure 19, the timeline of the joint course is illustrated. The course was conducted for a duration of six weeks, during which the students were required to work collaboratively and develop a project in their respective learning teams. The research instruments were used to collect the students' reflections on their learning experiences, after the first meeting, the fourth, and the last meeting. The participants were previously unfamiliar with each other and had no shared learning experiences. Despite this, they were expected to work collaboratively and develop a project-based learning framework that would fit the online learning environment. The project-based learning (PBL) approach was adapted to facilitate online learning, and students were required to work together in teams to create and present their projects online.

The course had minimal direction and structure, which included the random distribution of participants into teams by teachers, a list of real cases and related topics for the students' project and team-based learning activities, prompts for the project topic through videos and direct support from labor market stakeholders and local experts, and long-term support from the teachers throughout the project's development, if needed.

Figure 20. *Extract from students` presentations*

The learning materials were provided for the students as digital contents, open educational resources, presented through synchronic online lectures and posted on the Google Classroom platform created for this UVT-NTNU Joint course. The following screenshots present examples of such learning materials (Figure 21).

Figure 21. *Examples of learning materials posted on the Google Classroom learning platform for the students attending the Classroom Laboratory UVT-NTNU Joint Course*



CLASSROOM LABORATORY UVT-NTNU JOINT COURSE
2022-2023

Jens Røyrvik: Team collaboration and organisation, 9 Nov 2022

Melinda Dinca • 9 nov. 2022

Team collaboration and orga...
Video

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power distance in organizations and worktems - examples

Melinda Dinca • 16 nov. 2022

2022_Examples of power dis...
PDF

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2022-2023

Håkon Fyhn: Communication Across Distance (26 Oct 2022)

Melinda Dinca • 26 oct. 2022

1st part: https://drive.google.com/file/d/1mes1GVyLm2vmc7fL8czQph0UGgBgIZfv/view?usp=sharing

2nd part: https://drive.google.com/file/d/1Kz6kD1rqIXNp-hlZ0ASrrijipcef74Rv/view?usp=sharing

CLASSROOM LABORATORY UVT-NTNU JOINT COURSE
2022-2023

DATA SOURCES

Melinda Dinca • 12 oct. 2022 (Editat la 2 nov. 2022)

Video interviews with local NGOs representatives, on the ClassroomLab project website:https://classroomlab.uvt.ro/pages/Joint.html
You may contact also the following NGOs, experienced and very active in Timisoara:
Intercultural Institute Timisoara: https://www.intercultural.ro/en/home-page/
Social Initiative Group LOGS: https://grupullogs.ro/
Timisoara Counitary Social Assistance: https://socialtm.ro/
For You (social and occupational programs for adults with disabilities): https://pentruvoi.ro/
Timisoara Community Foundation: https://www.fundatiacomunitaratimisoara.ro/

COUNTRY REPORTS:
2019, EC, European Anti-Poverty Network [EAPN], Thematic report of in-work poverty in Romania file:///G:/My%20Drive/CursuriSeminarii/ClassroomLab/References_SocialProtection/ESPN_RO_TR1_2018-19%20on%20in-work%20poverty_final.pdf
2019, EC, Romania country report – prevention and correction of macroeconomic imbalances https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-romania_en.pdf
2015-2020, Government of Romania's Strategy for Roma Inclusion https://ec.europa.eu/info/sites/info/files/roma_romania_strategy2_en.pdf
2019, US Department of State, Bureau of Democracy, Human Rights and Labour https://www.state.gov/wp-content/uploads/2020/04/ROMANIA-2019-HUMAN-RIGHTS-REPORT.pdf
2020, InfoMigrants (ANSA, RFI, DW), https://www.infomigrants.net/en/country/Romania/
2020, International Organization for Migration [IOM] Romania https://www.iom.int/countries/romania
2020, Asylum Information Database [AIDA] Romania https://www.asylumineurope.org/reports/country/romania/statistics
2019, World Health Organization [WHO], State of Health in the EU – Romania https://www.euro.who.int/__data/assets/pdf_file/0009/419472/Country-Health-Profile-2019-Romania.pdf

CLASSROOM LABORATORY UVT-NTNU JOINT COURSE
2022-2023

2019, World Health Organization [WHO], State of Health in the EU – Romania
https://www.euro.who.int/__data/assets/pdf_file/0009/419472/Country-Health-Profile-2019-Romania.pdf
2020, European Commission [EC], Romania - Long-term care https://ec.europa.eu/social/main.jsp?catId=1126&intPageId=4757&langId=en
2020, European Association of Service Providers for Persons with Disabilities [EASPD]
https://www.easpd.eu/en/content/romanian-government-neglects-persons-disabilities-employment-rights-meet-eu-fiscal
2020, European Social Survey, https://www.europeansocialsurvey.org/findings/topline.html
2020, European Values Study, https://europeanvaluesstudy.eu/

EUROSTAT (EUROPEAN STATISTICS) – https://ec.europa.eu/eurostat/databrowser/explore/all/all_themes?lang=en
Energy crisis:
Greenhouse gas emissions per capita (online data code: T2020_RD300)
Energy productivity (online data code: T2020_RD310)
Energy dependence (online data code: T2020_RD320)
Share of renewable energy in gross final energy consumption(online data code: T2020_RD330)
The recycling rate of municipal waste (online data code: T2020_RT120)
Energy taxes (online data code: T2020_RT300)
Energy taxes by paying sector (online data code: T2020_RT310)
Environmental tax revenues (online data code: T2020_RT320)
Final energy consumption in households (online data code: T2020_RK200)
Modal split of passenger transport (online data code: T2020_RK320)
Eco-innovation index (online data code: T2020_RT200)
Occupied conventional dwellings by number of rooms (online data code: CENS_HNDWNR)
Occupied conventional dwellings by the presence of comfort characteristics (code: CENS_01NDCOMF)

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Occupied conventional dwellings by the presence of comfort characteristics (code: CENS_01NDCOMF)
Awareness, Social enterprises, New Normal related to poverty and social exclusion:
Dwellings by type of ownership, type of building, occupancy status (code: CENS_01NDBUILD)
Household characteristics by type of household (online data code: HBS_CAR_T313)
Household characteristics by the degree of urbanization (online data code: HBS_CAR_T315)
The employment rate (online data code: TESEM010)
Unemployment rate (online data code: TPS00203)
Activity rates by sex, age, and educational attainment (code: LFSQ_ARGAED)
Employees by sex, age, and occupation (online data code: LFSQ_EEGAIS)
Gender employment gap (online data code: TESSEM060)
Disability employment gap (online data code: HLTH_DLM200)
Social protection expenditure – disability function (code: SPR_EXP_FDI)
The employment rate of non-EU nationals (online data code: TESSEM090)
Young people neither in employment nor in education (code: LFSI_NEET_A_H)
Outflows of employment to inactivity, by type of activity (code: LFSI_LONG_E10)
The share persons at risk of poverty (online data code: TESSI010)
Persons at risk of poverty by most frequent activity status (code: ILC_PEPS02N)
Persons at risk of poverty by educational attainment level (code: ILC_PEPS04)
Relative median poverty risk gap (online data code: TESSI030)
Material Deprivation rate ((online data code: TESSI080)
Housing cost (online data code: TESSI060)
Overcrowding rate (online data code: TESSI170)
Mean consumption expenditure by nr of active persons (code: HBS_EXP_T132)
Social protection expenditure – social exclusion (online data code: SPR_EXP_FEX)
Out-migration, refugees, and asylum seekers:
Immigration (online data code: TPS00176)
Immigration by age group, sex, and country of birth (online data code: MIGR_IMM3CTB)
Emigration (online data code: TPS00177)
Emigration by age group, sex, and citizenship (online data code: MIGR_EMI1CTZ)
Loss of citizenship by sex and new citizenship (online data code: MIGR_LCT)
Population by sex, age, migration status, and educational level (code: LFSQ_PGAIED)
Population with Ukrainian citizenship (online data code: CENS_21UA_YAE)

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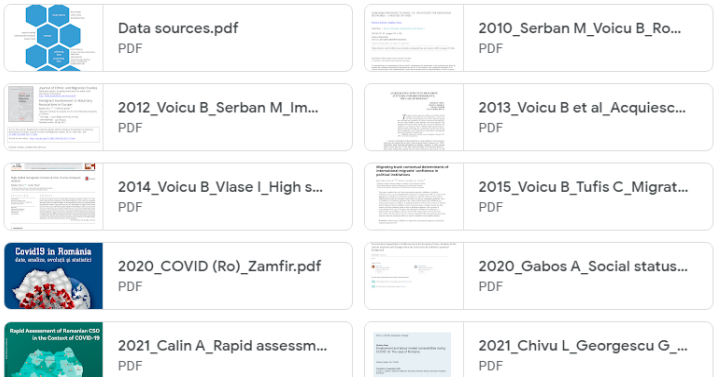
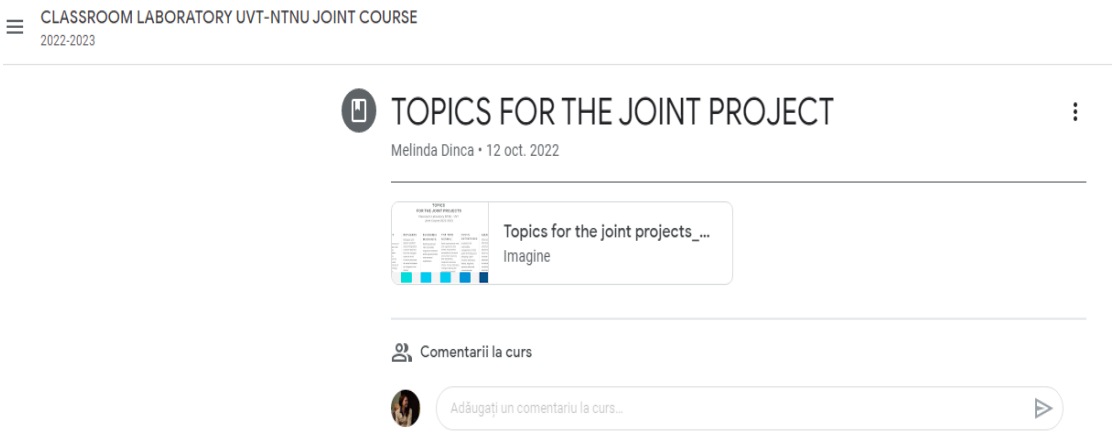
Population by sex, age, migration status, and educational level (code: LFSQ_PGAIED)
Population with Ukrainian citizenship (online data code: CENS_21UA_YAE)
Authorizations for the purpose of seasonal work (online data code: MIGR_RESSW2)
Authorization for study and research (online data code: MIGR_RESRATH)
First permits issued for family reasons (online data code: MIGR_RESFAM)
First permits issued for education reasons (online data code: MIGR_RESEDU)
First permits issued for remunerated activities reasons (code: MIGR_RESOCC)
Long-term residence permits among all non-EU citizens (code: MIGR_RESSHARE)
Asylum applicants, annual aggregated data (online data code: MIGR_ASYAPPCTZA)
Asylum applications withdrew annual aggregated data (code: MIGR_ASYWTHA)
Asylum applicants considered to be unaccompanied minors, annual (code: MIGR_ASYUNAA)
Final decisions on asylum applications, annual data (online data code: TPS00193)

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TOPICS FOR THE JOINT PROJECT
Melinda Dinca • 12 oct. 2022
Topics for the joint projects_...
Imagine
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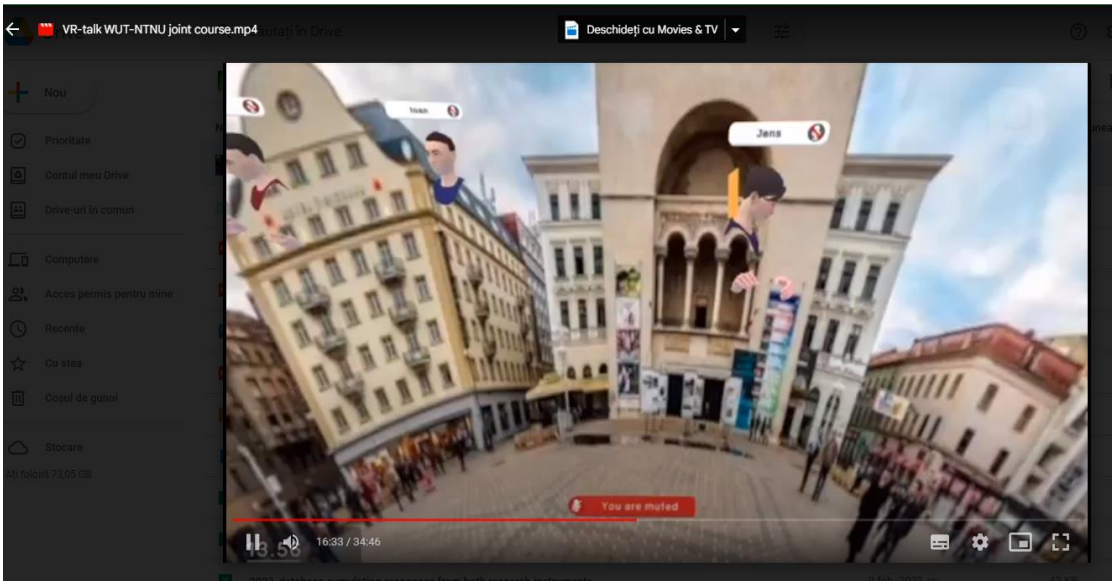

VR-talk WUT-NTNU joint course.mp4
Deschideți cu Movies & TV
Jens
You are muted
16:33 / 34:46


VR-talk WUT-NTNU joint course.mp4
Deschideți cu Movies & TV

Figure 22 presents the prompt for possible project topics, which are related to the main social issues in European countries and specifically in Romanian society. These topics are of genuine research and innovation interest in the current time. By challenging the students to find practical solutions for social problems such as those related to the current war in Ukraine or the effects of the COVID-19 pandemic on the work integration opportunities for vulnerable people, the course aims to provide an authentic learning experience for the students by bringing real-life situations into the virtual classroom. Moreover, the cross-cultural and cross-disciplinary composition of the student teams is intended to leverage the added value of multiple perspectives from students with diverse educational backgrounds, research interests, and cultural origins.

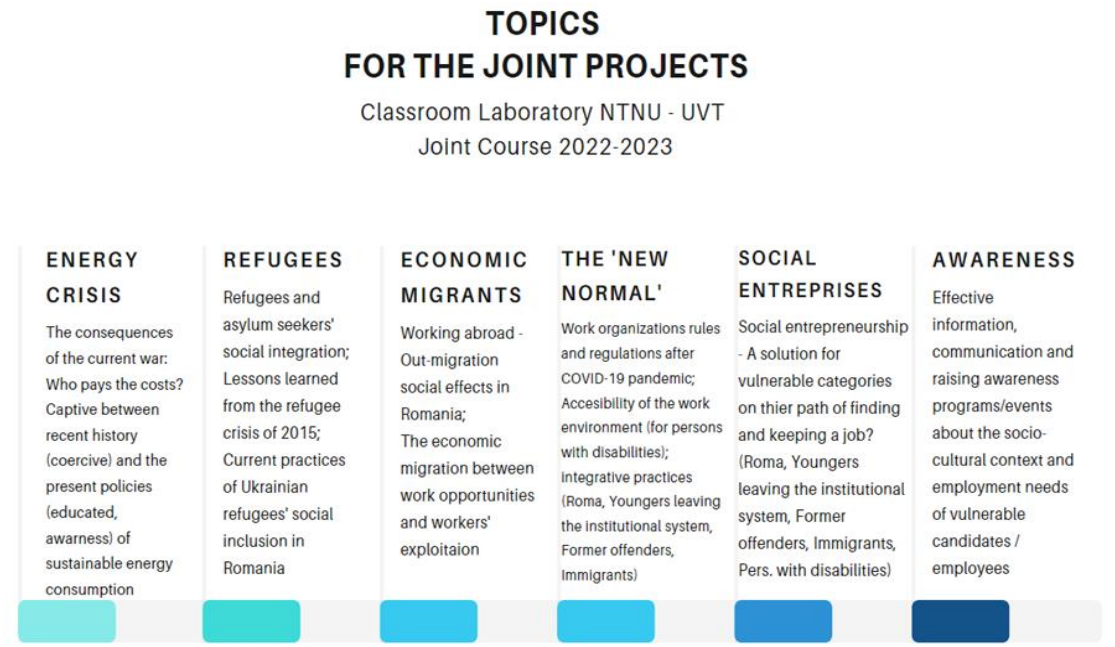


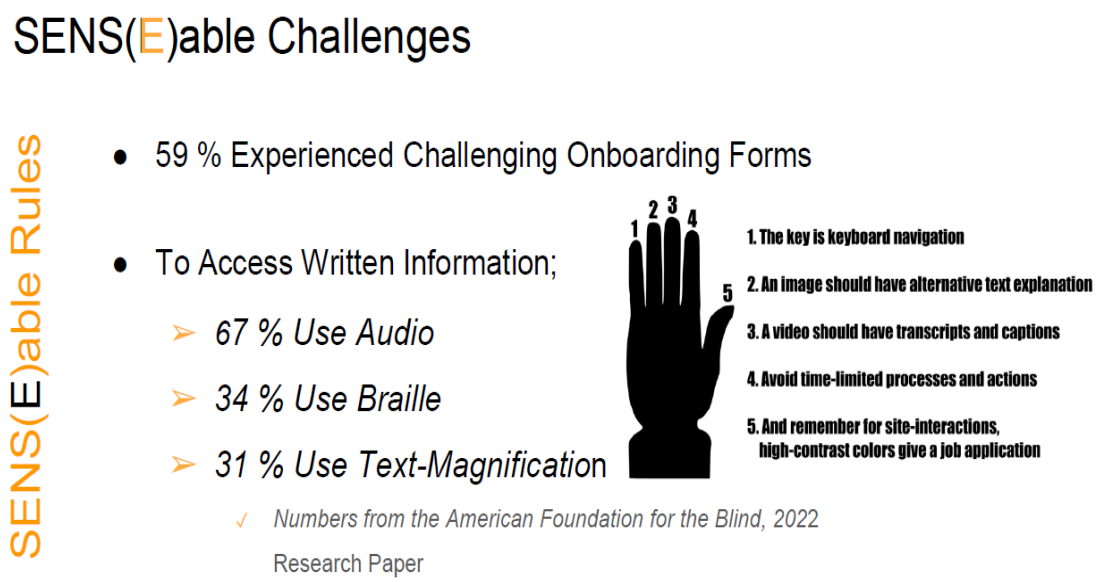
Figure 22. *Real-life cases and related topics proposed for the students project-based learning activities.*

Subsequently, the students had the opportunity to select or tailor their own research questions based on these topics. Figure 23 shows the project topics chosen by the student teams.

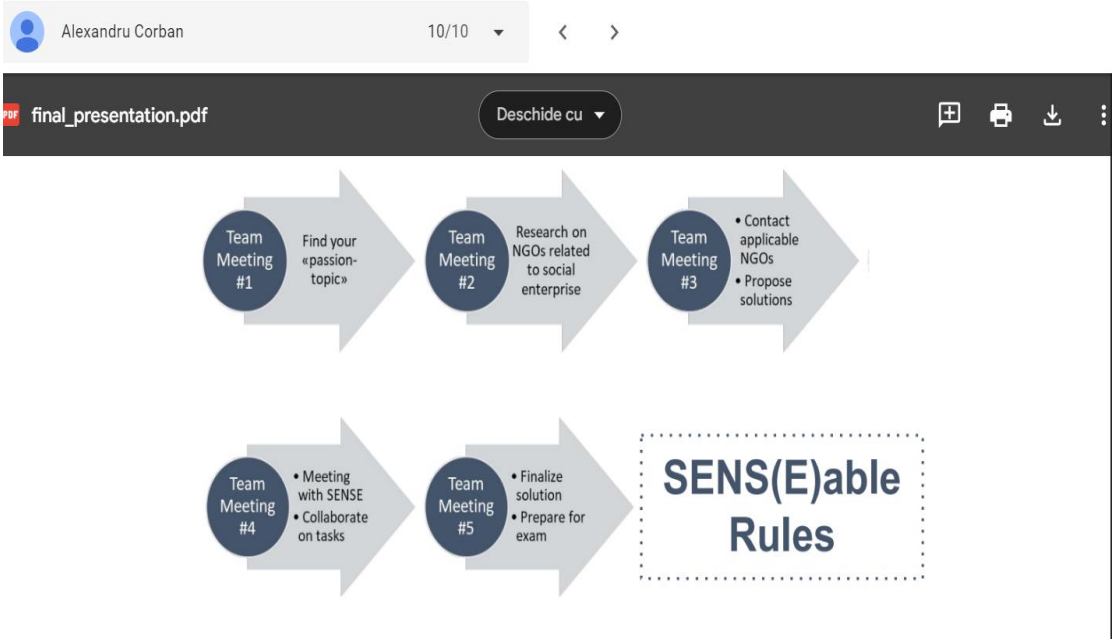
***Figure 23**. Projects topics for the team-based learning activities, as they are presented by the students.*

Students team 1.
Project title: **Providing Ukrainian Refugee Mothers with the Ability to Enter the Romanian Workforce**

Students team 2.
Project title: **SENS(E)abl Rules for Romanian Job Portals**



Project PRESENTATION



Students team 3.
Project title: **A warm solution for a cold situation**

Challenges

Human and organisation

- Borderline corruption/brotherhood
- Judging
- Help from a several countries

White elephants

- Operation and maintenance
- Quality insurance
- Kids and a municipal building

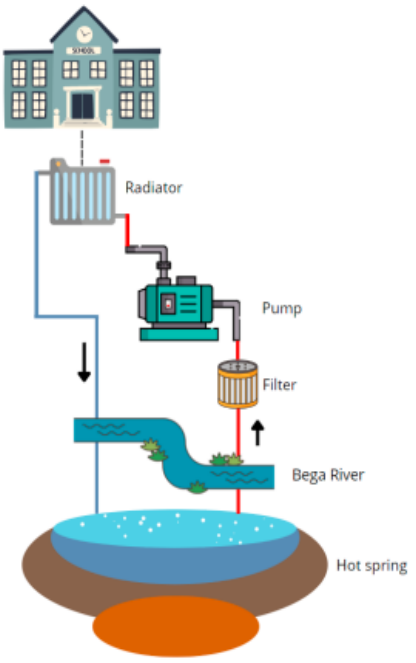
Solution

Geothermal energy

Sânmihaiu Român

Hot spring that holds 66°C

Școala Gimnazială Sanmihaiu Român



Students team 4.
Project title: **Work together, evolve together.**
Awareness campaign for Romani unemployment

- The idea
  - Brainstorming
  - Norwegian experience
- PR campaign
  - Objektive
- SWOT analysis

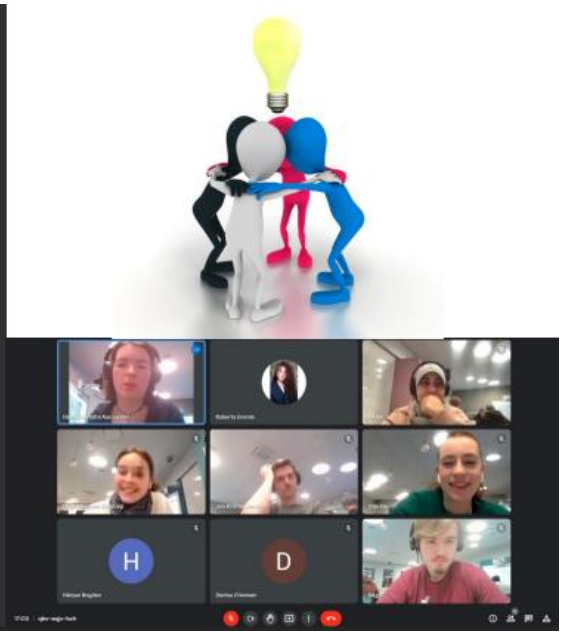
"Work together, evolve together"

Strength	Weakness
- Diverse Team - Local knowledge	Difficult task - Sociocultural characteristics
Opportunities	**Threats**
- Local economic growth	- Anti romani figures and groups

Students team 5.
Project title: **Mentorship program for Roma children**

Choosing a project

- Brainstorming
  - Three different groups to consider
    - The parents
    - The teachers
    - The children
  - The parents too difficult for us to handle.
    - NGO already on this.
  - Joint solution for teachers and children
- OneDrive
- Romanians influenced by media
  - Not much previous knowledge
  - Media gives bad image of Roma



Strategy

- NGO - *Policy Center for Roma and Minorities*
  - Policy center
- Media campaign
  - Posters
  - Social media
  - Rogue tactics (memes)
- Meeting different parties
- Hosting a event

Policy Center
for Roma and Minorities

The problem: Early dropout

- "Early" dropout by the Roma people
- Consequence of low education
- The government is already taking action
- Despite this, a majority of the Roma people drop out
  - 1 of 20 drop out early
  - 31% can´t read or write
  - 68% drop out before 16
- Goal: to give Roma children equal opportunities to perform at school, despite having uneducated parents and being discriminated against.

Students team 6.
Project title: **Integration of immigrants in Timișoara**

Integration of immigrants in Timișoara

Why we chose this problem

- In Timisoara came a lot of immigrants
- Immigrants are not accepted by some people
- Immigrants are strangers to Romanian customs and culture

WE CARE!

- We started the project with the idea of helping as many people in need as possible
- We want to make a change in society

Our final solution

- Different courses for both adults and children
- Adults:
  - Two options, 8- and 16-week programs
  - Two four-hour sessions a week
- Children:
  - More thorough
  - Better monitoring of the children's development
- Will work as a "daycare" while the adults are learning

Students team 7.
Project title: **The new normal**

Chosen theme and phenomenon based on "the new normal"

- Where there similar problems between Norway and Romania?
- Started looking at how the pandemic affected younger people
  - Different age groups
  - Narrowing down the scope of assignment
- Students drop out during covid
  - Regional to Timisoara
- Ended up with:

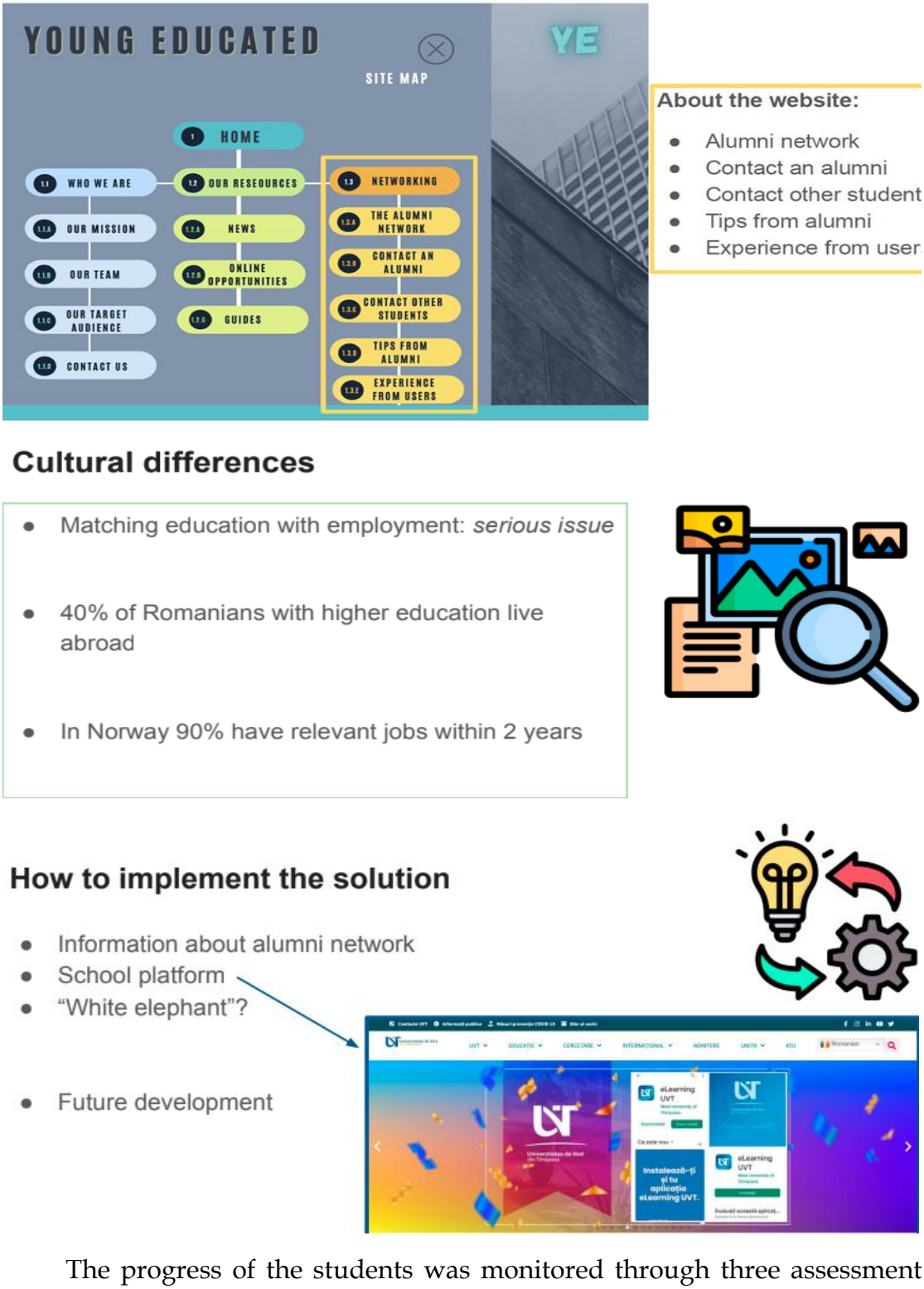
"Reintegrating dropout students into the school system"

Future plans

Create strong relationships with companies and workplaces in Timisoara

- For future students
- Continuously improving Timisoara as a student city and its attractiveness
- Funding and Marketing

Students team 8.
Project title: **Young educated**



The progress of the students was monitored through three assessment phases: at the beginning, middle, and end of the course (T1, T2, T3). The students were required to complete two quantitative questionnaires and a reflective journal as part of the assessment process.

RESEARCH
RESULTS

This quasi-experimental study investigates the impact of reflective learning on students' transversal competencies in a cross-cultural and cross-disciplinary Virtual Problem-based Learning (VPBL) setting. The study utilizes a mixed-methods approach and collects data longitudinally through questionnaires and qualitative content analysis of students' reflections at three different stages of the course. The results indicate that reflective learning can foster the development of students' cross-cultural communication, teamwork, digital, and cultural competencies in a VPBL and reflective learning setting. All students appreciated the benefits of the innovative curriculum design and cross-cultural and cross-disciplinary learning context, leading them to reflect on their learning process. Direct interactions and shared learning tasks enabled students to learn from each other. The study finds that students improved their communication and teamwork skills, particularly through digital means, and developed their cultural understanding of work-life relations, essential for future work-life when working for multinational teams and clients from other countries. The study contributes to the literature on reflective learning and its impact on transversal competencies development in a cross-cultural and cross-disciplinary context.

The main results are presented using the transferable skills structure for presenting the results since the targeted learning outcomes for the Classroom Laboratory UVT-NTNU Joint Course and consequently, the research instruments are structured in the same way.

REFLECTIVE LEARNING

The analysis of the learning process in transcultural context was carried out by analyzing the way in which the study participants reported their perspective on the development of reflective learning skills. Thus, the study participants were invited to express themselves regarding the importance they give to reflective learning in two distinct moments, just before the course started and at the end of the learning activities. In measuring the importance

given to reflective learning, the statement "Reflective learning skills are important to me" was used, respondents having the possibility to choose between 5 answers, where *1 - strongly agree*, respectively *5 - strongly disagree*. The average of the responses expressed by the study participants highlights the presence of a high level of interest in reflective learning in both moments of the measurement. Analyzing the inventoried answers (Fig. 24, 1) we observe a slightly higher interest before the start of the cross-cultural and cross-disciplinary team-based interaction process (M = 4.44, SD = 0.5) compared to the moment of completion of the course (M = 4.33, SD = 0.53). Although we can observe the existence of a more limited average value in terms of the importance given to the reflective learning skills at the end of the course, we appreciate that this difference in not statistically significant, a fact that leads us to consider that regardless of the time of evaluation of the participants in the study, they have maintained a high interest in the development of such competence.

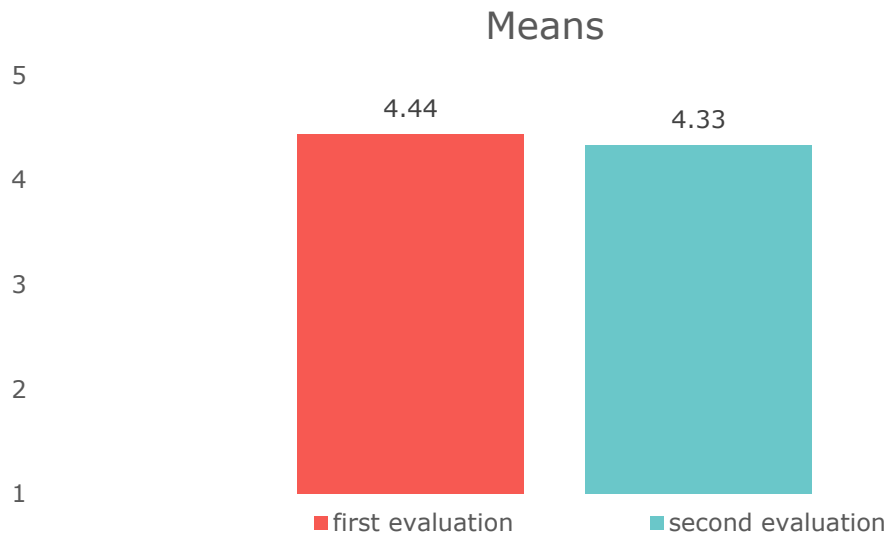


Figure 24. *Importance given to the reflective learning skills*

In order to capture in more detail the importance given to reflective learning skills development, we carried out a differentiated analysis at the level of the students groups by university, for each time of self-evaluation. To identify whether the importance given to reflective learning skills can be related to the university of origin, we used the Mann Whitney test, as a result of the fact that the frequency distributions for the variables in question did not have a normal distribution. The results obtained are highlighted in Figure 25.

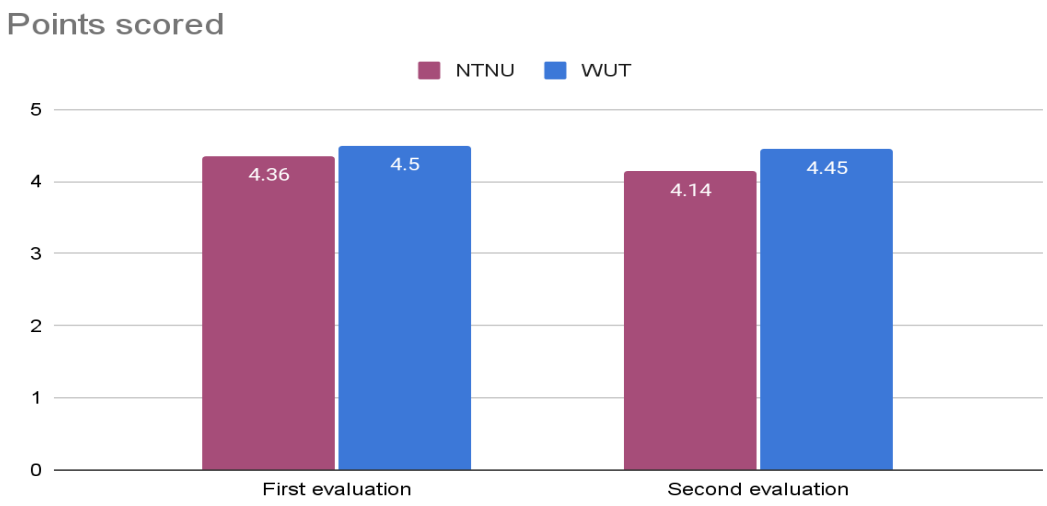


Figure 25. *Comparison of the importance attributed to Reflective learning by university*

Thus, for each of the two evaluations, the values of the Mann Whitney test (Table 4) highlighted the fact that the study participants give the same level of importance to the development of their reflective learning skills, regardless of the university of origin. In other words, regardless of the university and country of origin, the students showed interest in developing their reflective learning skills, capitalizing on cross-cultural and cross-disciplinary team-based learning experience.

In addition to measuring the level of importance attributed to reflective learning skills, the study also included self-assessments of these skills by the participants at two points during the course. This was done to identify any differences or elements of creative tension that may have emerged between the initial and completion stages of the learning process. Such creative tension could reflect the participants' growing awareness of their own level of reflective learning competencies, thereby creating an environment conducive to motivation and active engagement in the learning process. Furthermore, the use of reflective learning skills may also serve as a valuable monitoring and evaluation tool for the participants' future learning progress in both academic and professional settings.

Table 4. *The Mann Whitney test for reflective learning skills by university of origin*

		Univ.	n	Mean Rank	U	Z	p
First evaluation	Reflective learning (RLS)	NTNU	14	16.93	132	-.829	.407
		UVT	22	15.50			
Second evaluation	Reflective learning (RLS)	NTNU	14	15.00	105	-1.867	.062
		UVT	22	20.73			

Since the self-perception level of reflective learning skills was measured at two different times in the same group of students, we used the Wilcoxon test for paired samples. The results highlight the fact that the involvement of the students in the learning process, respectively in the cross-cultural and cross-disciplinary team-based learning activities, generated significant effects in terms of self-perceptions. The students self-assessment level of reflective learning competencies was more moderate at the time of the second evaluation compared with the initial time (see Table 5). These significant differences can be explained by the enthusiasm and overvaluation of the study participants at the initial moment, combined with the fact that by the time of completing the UVT-NTNU joint course, they became more aware of their reflective learning competence level that they have. This awareness reflects what we called *creative tension* and could constitute a good premise for an authentic updated awareness of one's own level of competence.

It should be noted that the size of the effect generated by the participation in the course and in the team-based learning activities carried out on the self-perception of the level of reflective skills is of a very strong intensity at the level of the entire group (r = 0.73) and at the level of the group students from UVT (r = 0.82), respectively of the strong internality at the level of the NTNU students group (r = 0.56). In other words, the experience gained as a result of the participation in the UVT-NTNU joint course, the high level of direct interactions and involvement of students in cross-cultural and cross-disciplinary team-based learning activities generated an effect on the way in which the students self-assessed reflective skills.

Table 5. *Paired sample Wilcoxon test for reflective learning skills before and after the course*

	Creative tensions				
Reflective learning skills (RLS)	My actual (T1)	My actual (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.86	3.08	-0.78	-4.365	0.000
NTNU	3.93	3.43	-0.50	-2.111	0.035
UVT	3.82	2.86	-0.95	-3.827	0

The level of self-assessed reflective skills proved not to be influenced by the study programs the students attend, nor by belonging to a certain gender. Thus, we can see in table 6 that equally students attending a study program in the STEM category, respectively those who study a non-STEM program, have

the same reporting model. The self-evaluation from the second moment records more low values as a result of the increased awareness of the level of reflective skills compared to the initial moment. Thus, the level of effect generated by participation in the cross-cultural and cross-disciplinary learning contexts on one's reflective competencies self-assessment turns out to be strong between the participants attending a STEM study program, (r = 0.60) compared to the very strong effect recorded by students attending a non-STEM study program (r = 0.81).

Regarding the gender self-identification, we can see that there are no specific models for a certain gender regarding the process of reflective skills self-assessment, a fact for which women, men and non-binary self-identified students have recorded ore limited values for their self-assessed level of reflective learning skills at the time of the second self-assessment. The effect generated by the course setting and its learning activities on the students defined their level of reflective competencies in the case of very strong intensity for women (r = 0.74), men (r = 0.71) and non-binary.

Complementary with the importance given to reflective learning and self-evaluation of the reflective learning skill level and in order to have an in-depth understanding of how the study participants relate to the cross-disciplinary and cross-cultural learning experiences, we present the results obtained from the Self-assessment transversal skills questionnaire (STSQ).

Table 6. *Wilcoxon test for reflective learning skills by field of study (STEM and non-STEM) and by gender*

Reflective learning skills (RLS)	Creative tensions				
	My actual (T1)	My actual (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
Area of science					
STEM	3.93	3.40	-0.53	-2.309	0.021
Non-STEM	3.81	2.86	-0.95	-3.704	0.000
Gender					
Woman	3.83	3.04	-0.79	-3.626	0
Man	3.92	3.17	-0.75	-2.46	0.014

In Table 7 are the descriptive indicators for the students' self-assessment of their reflective learning skills before and after completing the UVT-NTNU joint course.

Table 7. *Descriptive indicators for the Reflective learning skills measured with STSQ questionnaire (before and after the course)*

Reflective learning skills	N	Min.	Max.	Mean	Std. Dev.
Moment of evaluation					
before course	39	3.00	5.00	3.9295	0.43660
after course	39	1.00	5.00	4.1987	0.67419
NTNU					
before course	19	3.00	4.50	3.7763	0.36223
after course	19	1.00	5.00	4.0395	0.80908
UVT					
before course	20	3.25	5.00	4.0750	0.45955
after course	20	3.75	5.00	4.3500	0.48936

The reflective learning skills dimension highlights the fact that after the cross-cultural and cross-disciplinary learning experiences, the students attending the UVT-NTNU joint course obtained higher scores compared to the beginning of the course. However, to check if these observed differences are significant from a statistical point of view, we opted to use the Wilcoxon test. Thus, in Table 8 could be observed that these differences are statistically significant and are valid both at the level of the entire sample and at the level of each group of participants from UVT and NTNU. In other words, the experiences gained during the course generated a higher level of self-assessed reflective learning competence.

Table 8. *The Wilcoxon test for Reflective learning skills before and after the course (all participants, NTNU and UVT participants)*

	reflective learning				
	before course (T1)	after course (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.93	4.20	-0.27	-3.459	0.001
NTNU	3.78	4.04	-0.26	-2.225	0.026
UVT	4.07	4.35	-0.28	-2.679	0.007

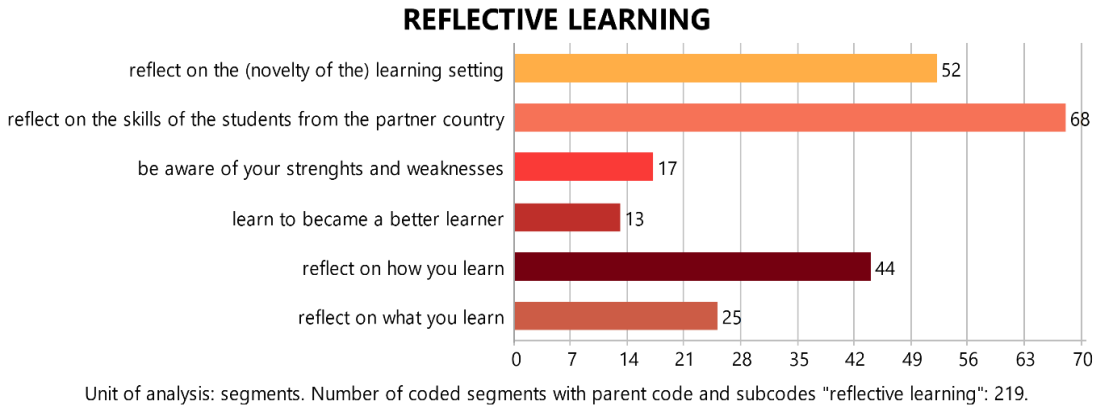


Figure 26. *Coded segments – Reflective journal. Reflective learning skills*

The reflective journal was used to encourage students to self-assess and openly express their reflective practice during the transnational learning activities of the UVT-NTNU joint course. Of the total number of sources documents, 94 out of 127 were valid, and 219 text-fragments directly related to reflective learning practices were identified. The code system statistics presented in Figure 26 illustrate the absolute frequency of text-segments categorized under the code reflective learning. The text segments that were coded with the reflective learning code refer to the UVT-NTNU joint course setting, the learning process, and learning outcomes, from the perspective of the students.

The reflective learning code relations hierarchy analysis revealed that students often associated reflective practices with team-based learning activities and the cross-disciplinary and transnational composition of their group. For instance, many students reflected on the novelty of the learning setting and the cultural diversity of their team composition. They appreciated the advantage of utilizing the knowledge, experiences, ideas, and skills of their teammates as resources for solving group tasks and achieving learning objectives.

Furthermore, students showed a positive attitude towards the course setting, particularly its cross-cultural dimension. Some of them mentioned that the learning activities on this course were their first collaborative and learning experience with students and teachers from another country and university. Thus, the reflective journal served as an effective tool for encouraging students to reflect on their learning experiences and helped to uncover the perceived advantages of cross-cultural and transnational learning activities.

> *„I am already quite familiar with reflective learning. However, most of my reflective learning has happened with things that are more academic, like math, physics and engineering. Not with a course like this, so it will be a little*

unfamiliar. But I believe by taking a course like this, my reflective learning abilities might improve because this course it's so different." (NTNU student, male, 22 years old, VR, T1)

„We go from the classic lectures to learning in VR online [virtual reality workrooms], with students from across the continent, with whom we have to solve a real-life social issue. Personally, I find this a wonderful opportunity to get to know people I otherwise wouldn't and to expand my skill set in areas I otherwise wouldn't get the opportunity to." (UVT student, male, 21 years old, VR, T1)

„I find it very exciting to collaborate with people who have a different background to myself. Gaining knowledge about how others live, their culture, norms and everyday life challenges. Getting this knowledge directly from someone who lives and knows these things at first hand adds more than just reading the syllabus, searching online, or seeing it through „Norwegian eyes" in the media." (NTNU student, female, 28 years old, non-VR, T1)

„It is my first experience working with foreign students and debating topics in a different language from my mother tongue. I did not expect this to work so easily with people from another country. For me it is the type of course I attend for pleasure and where I can acquire my communication and teamwork skills." (UVT student, male, 21 years old, non-VR, T1)

The teachers' encouragement for students to reflect on their learning process and outcomes resulted in the students expressing what they learned and how they learned it. From the analysis of multiple text-segments retrieved from students' reflective journals, it was found that the students practiced reflective learning throughout the entire Classroom Laboratory UVT-NTNU Joint Course (T1, T2 and T3), including self-assessment practices. This outcome is important in understanding the role of reflective learning in motivating students to actively engage in the learning process and make continuous efforts to achieve learning outcomes throughout the process, rather than just before the final exam, as is usually the case with summative assessment.

„I have learned how to openly communicate my thoughts in different scenarios and with people from different cultures and with different ideas. I learned about culture and how to work around it." (UVT student, female, 23 years old, non-VR, T1)

„This course helps us to develop our learning, listening and teamwork skills". (UVT student, male, 21 years old, non-VR, T2)

„(…) this is a very educational and exciting project, which has made me more aware of the differences and similarities between Norway and Romania." (NTNU student, female, 22 years old, VR, T2)

„I became a better team co-worker. It was really helpful to work with foreign students, to share our experiences and create solutions for a real social problem.

It was an amazing experience to succeed to do all this in such a short time." (UVT student, female, 21 years old, non-VR, T3)

„I definitely have learned a lot about collaboration across digital platforms to produce ideas into solutions." (NTNU student, male, 23 years old, non-VR, T3)

There was an important dimension observed in the reflective practice of the students, namely peer-assessment reflections on other students' skills and what they learned from their peers' knowledge, experiences, and competencies.

"*I am interested to discover how the students from Norway are organizing themselves to develop a project and to work in a team. I learned from them how to communicate more directly and effectively." (…) "I noticed how better the educational system in Norway is at developing teamwork skills to their students, how the Norwegian students quickly mobilize themselves and how generous they are in sharing information.*" (UVT student, female, 32 years old, non-VR, T1)

"*I have learned a lot from working with interdisciplinary students and especially students from other cultures*." (NTNU student, female, 21 years old, VR, T3,)

"*I appreciated from the beginning the fact that the Norwegians were well organized. They also directed the discussions and meetings between us. I feel like I've developed my communication and collaboration skills*." (UVT student, female, 23, non-VR, T3)

COMMUNICATION SKILLS

The self-perceived importance given by the study participants to the communication skills highlighted the fact that in both moments of the assessment the communication skills had similar high values. This situation leads us to consider that the study participants value communication skills and maintain their high level of interest during the entire learning process. The average value for both moments of evaluation was M = 4.69, respectively SD = 0.46.

As far as the reporting to the study participants' university of origin, it was observed the similarity between the scores obtained in the first and the second round of evaluation of the self-perceived level of importance given for the communication skills. However, even if there were similarities in the self-perception of importance given to the communication skills between the two moments, we can observe the fact that there are differences between the

opinions of students from the two universities. Thus, the students from UVT appreciated the development of communication skills as more important than the way in which students from NTNU appreciated, the difference between the two groups being significant from a statistical point of view (Table 9).

Table 9. *The Mann Whitney test for communication skills by university of origin*

	Univ.	n	Mean Rank	U	z	p
Communication (CS)	NTNU	14	15	105	-1.992	.046
	UVT	22	20,73			

To identify the elements of creative tension in terms of the communication skills of the study participants represents an element of interest in our research approach. Thus, we set out to measure the level of subjective self-reported appreciation of the respondents regarding the communication skills they have. The measurement was made by using the statement "*My actual communication skills level is…*", respondents having the possibility to choose between five answers, where 1 - strongly agree, respectively 5 - strongly disagree, both at the beginning of the course and at the end of the cross-cultural and cross-disciplinary learning activities of the UVT-NTNU joint course. The analysis of the self-assessments was carried out using the Wilcoxon test on two paired samples and highlighted the fact that the entire group of participants in the study registered a more limited level of subjective perception regarding their communication skills level in the second moment of the evaluation, compared with the initial moment.

The explanation of the differences in the self-assessed level of communication skills between the two moments can be explained by the fact that through the activities carried out during the course the participants became more aware of their own skills and made a more realistic self-assessment, and by the fact that at the begging they overestimated their communication skills level. The magnitude of the effect generated by active participation carried out during the cross-cultural and cross-disciplinary learning activities on the participants' perception of their communication skills' level is strong (r = 0.64).

The differentiated analysis by the universities of origin of the participants also highlighted the tendency of a lower self-assessment level of the communication skills in the second moment of evaluation compared to the self-assessed communication skills level from the beginning of the joint course (Table 10). We can also observe that the team-based learning in cross-cultural and cross-disciplinary shows a very strong influence (r = 0.77) on the way of self-assessing the communication skills in the case of the group of study

participants from NTNU. Regarding the self-assessed level of the communication skills among students from UVT, we note this time that the size of the effect manifested by the cross-cultural and cross-disciplinary composition of the learning context on the self-assessments of the communication skills is strong (r = 0.57).

The differences between the self-assessment of the communication skills level at the two distinct moments can be appreciated as proof of the *creative tension*. Thus, between the two moments of reflection on their communication skills level, the participants had the opportunity to evaluate, reevaluate, compare and practice their communication skills and make a more realistic evaluation of them by being engaged in the team-based learning activities carried out during the cross-cultural and cross-disciplinary effective interactions.

In order to complete the picture of how the study participants self-assessed their communication skills in the two moments, it has been used as a reference to the specifics of the study programs, differentiating between study programs in the STEM category, respectively non-STEM. The obtained results highlight that the self-evaluation of communication skills level does not depend on the nature of the study programs. The way in which the self-assessment of communication skills level carried out is similar. Thus, for both categories of participants (STEM and non-STEM), in the second moment of self-assessment of communication skills level lower scores were obtained compared to the moment of the initial evaluation.

Table 10. *Paired sample Wilcoxon test for communication skills*

Communication skills (RLS)	Creative tensions				
	My actual (T1)	My actual (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.97	3.36	-0.61	-3.869	0.000
NTNU	4	3.29	-0.71	-2.887	0.004
UVT	3.95	3.41	-0.54	-2.676	0.007

This situation could be explained by the fact that after the active involvement and frequent interactions during the cross-cultural and cross-disciplinary team-based learning activities, the study participants became more authentic regarding their own communication skills level. These differences in perception of communication skills between the two moments could be appreciated as elements of creative tension and could allow the study participants to reflect on their own the real level of their communication skills, and on how they could be improved. Although the way of evaluating one's own competences was not different in the case of the two categories of study programs (STEM or non-STEM), the magnitude of the effect generated by the

cross-disciplinary and cross-cultural interactions generated different effects on the way in which communication competences were evaluated.

Thus, in the case of participants who attend study programs in the STEM field, the size of the effect was of very strong intensity (r = 0.79), compared to the size of the effect of strong intensity in the case of participants in the evaluation who attends non-STEM study programs (r = 0.55). In other words, in the case of participants from STEM fields, the elements of creative tension are more obvious, a situation that could highlight the fact that in the case of these participants, interactions outside their own scientific or cultural context generated a lower-level scores in the self-assessment of their communication skills, compared to participants from non-STEM fields.

The second element that we focused on in deepening the way in which the study participants evaluated their communication skills level refers to their belonging to a certain gender. Thus, gender variable does not generate elements of specificity in the way in which communication skills level were self-assessed. In the same way, women and men participants became more demanding at the second moment of evaluation of communication skills levels compared to the first moment.

This results can be explained by the fact that the learning and co-working experiences in a cross-cultural context, respectively the activities carried out together with people from other scientific fields (with specific concepts, ways of analyzing different situations, with different thinking structure, etc.) led the participants to become more reflective on their own communication skills. The size of the effect generated by the learning and working context (cross-disciplinary and cross-cultural) on the self-evaluation of communication skills level is of strong intensity both in the case of women participants (r = 0.67) and in the case of man participants (r = 0.61). In other words, the elements of creative tension will equally constitute the source of improving communication skills for all respondents, without differentiating between them, according to belonging to a certain gender.

Table 11. *Wilcoxon test for communication skills by field of study (STEM and non-STEM) and gender*

Communication	Creative tensions				
	My actual (t1)	My actual (t2)	Differences	Score z (ranks)	Sig. (2-tailed)
Area of science					
STEM	4	3,27	-0,73	-3,051	0,002
Non-STEM	3,95	3,43	-0,52	-2,517	0,012
Gender					
Woman	4	3,42	-0,58	-3,3	0,001
Man	3,92	3,25	-0,67	-2,126	0,033

Table 12 presents the descriptive indicators of how the study participants responded to the STSQ at the two evaluation moments:

The examination of the scores acquired by the study participants through the STSQ self-assessment of communication skills at the beginning and conclusion of the learning and interactive activities during the joint course accentuates that, during the final evaluation, both the overall cohort and each university individually demonstrated marginally enhanced scores in comparison to the initial assessment.

To ensure that the observed differences between the initial and final evaluations are not random but are a result of the learning, practice and enrichment activities related to communication skills, we conducted a paired samples Wilcoxon test.

Table 12. *Descriptive indicators for the communication skills measured with STSQ questionnaire (before and after the course)*

Communication (CS)	N	Min.	Max.	Mean	Std. Dev.
Moment of evaluation					
before course	39	2,40	4,60	3,6667	0,43850
after course	39	1,00	5,00	3,7949	0,59025
NTNU					
before course	19	2,40	4,60	3,6316	0,46792
after course	19	1,00	4,80	3,7158	0,74630
UVT					
before course	20	2,60	4,40	3,7000	0,41802
after course	20	3,20	5,00	3,8700	0,39617

The data was aggregated at both the overall study participant level and individual university level.

Table 13. *The Wilcoxon test for communication skills before and after the course (all participants, UVT and NTNU participants)*

	reflective learning				
	before course (T1)	after course (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.66	3.79	-0,13	-2.417	0.016
NTNU	3.63	3.71	-0,08	-1.596	0.110
UVT	3.7	3.87	-0,17	-1.900	0.057

The results of the Wilcoxon test presented in Table 13 indicate statistically significant differences between the scores obtained in the two evaluation moments for the entire sample. Specifically, the evaluation at the end of the course activities resulted in slightly higher scores compared to the initial assessment of communication skills. However, upon closer examination, the analysis at the individual university level revealed no significant differences between the initial and final assessments of communication skills for participants from either university.

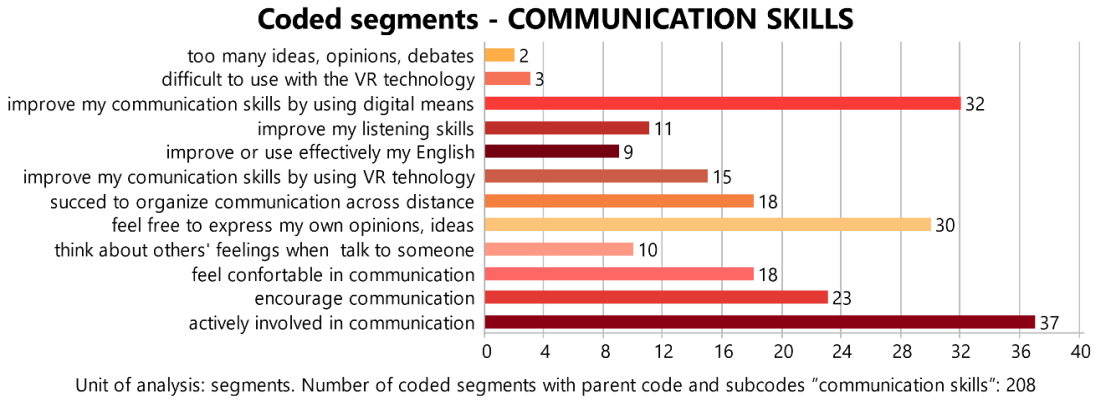


Figure 27. *Coded segments – Reflective journal. Communication skills*

A large number of the coded fragments from the responses of the open-ended question "Reflective journal" referred to the *communication skills* during the transnational learning activities of the UVT-NTNU joint course. There have been identified 208 text-fragments referring directly to communication skills. The code system statistics presented in Figure 27 shows the students' interest in improving their communication skills when they self-assessed the learning activities at the UVT-NTNU joint course.

The *communication skills* code relations hierarchy analysis shows that students associate their *involvement in communication* with the following connected activities:

- Reflect on the skills, knowledge and experiences of the students from the partner country,
- Express their own opinions and ideas,
- Involve in efficient teamwork interactions and acknowledge that they improve their team-based learning skills,
- Feel challenged, but also enthusiastic, interested and content.

The efficient communication across distances was the core frame of the UVT-NTNU joint course, meant to facilitate the team-based learning activities for the Norwegian and Romanian students, teachers and local experts participating at the Classroom Laboratory UVT-NTNU Joint Course in the academic year 2022-2023. The teachers co-created and shared with the students their knowledge and experience in communication, designed and made

available for students the necessary conditions to develop a common learning and workspace for synchronic and a-synchronic effective communication.

The students had access to digital open education resources and to advanced technology for communication across distances of virtual reality technology. They might choose and combine the technological infrastructure, online platforms and tools offered by the UVT and NTNU partner universities with any other digital technology to communicate effectively and build a virtual common workspace for their team-based learning activities. In consequence, students communicate through meetings on Zoom and Google meet, installed and get used with the VR devices, used Meta Quest virtual reality workrooms, but also used a-synchronic communication tools, like WhatsApp, Discord, Google drive, Google classroom, MS teams or similar.

The students noted in their reflective journal how they succeed to organize the communication across distance, between their team members from Norway and Romania:

> "*[To facilitate communication] has contributed the digital arrangements of meetings and the common platform for sharing thoughts and ideas, Google docs on Google drive.*" (NTNU student, male, 24 years old, non-VR, T1)
>
> "*Our communication has been facilitated through our meetings in VR. We have now the ability to mediate communication and to organize digital materials*" (UVT student, male, 21 years old, VR, T2)
>
> "*We organized [online] meetings apart of the course's schedule to talk about the project*". (UVT student, female, 21 years old, VR, T2)
>
> "*We decided to divide the hours up more during the week. By meeting more frequently and for a shorter time, the relations between the team members would be better established*". (NTNU student, male, 26 years old, non-VR, T2)

Apart from the technical variety and time management issues, during the first phase of the learning process (noted T1 – Teambuilding phase) students reflected on the quality of the communication, the challenges and obstacles they encountered when trying to ensure a good start for the teamwork activities. The students' notes revealed their communication practice by:

- Being concerned about involving all the team members in the communication process,
- Trying to efficiently navigate through brainstorming collected ideas of all the team members,
- Become aware about the cultural differences between Romanian and Norwegian students regarding the communication encounters, rules and practices,
- Trying to overcome the communication barriers and create a shared communication space for their cross-cultural and cross-disciplinary team-based learning activities.

"During our meetings we've discussed every single one of our opinions, giving our pros and cons to each one of them. It's hard to keep track of everyone's thoughts, but in the end we've managed to come to a conclusion, while trying to collaborate with everyone that's part of the team." (UVT student, male, 22 years old, VR, T1)

"Getting everyone's opinion is sometimes difficult. But overall I think the group is doing a good job communicating!" (NTNU student, male, 21 years old, non-VR, T1)

"One of the solutions for the shortness of time would be that encouraging meetings outside of the classroom schedule would push students to meet." (NTNU student, male, 26 years old, non-VR, T1)

"At the same time, it is also what is most instructive, to have a slightly "chaotic" process where you have to get to know each other, while at the same time you have to collaborate professionally towards a goal. You often get to know each other - and yourself, well in such a process." (NTNU student, female, 28 years old, non-VR, T1)

"I think that this course helped me to better communicate using digital tools." (NTNU student, male, 21 years old, non-VR, T3)

Moreover, students reflect on their communication skills when they explain the team-based learning process in their final projects presentations, as could be seen in Figure 28.

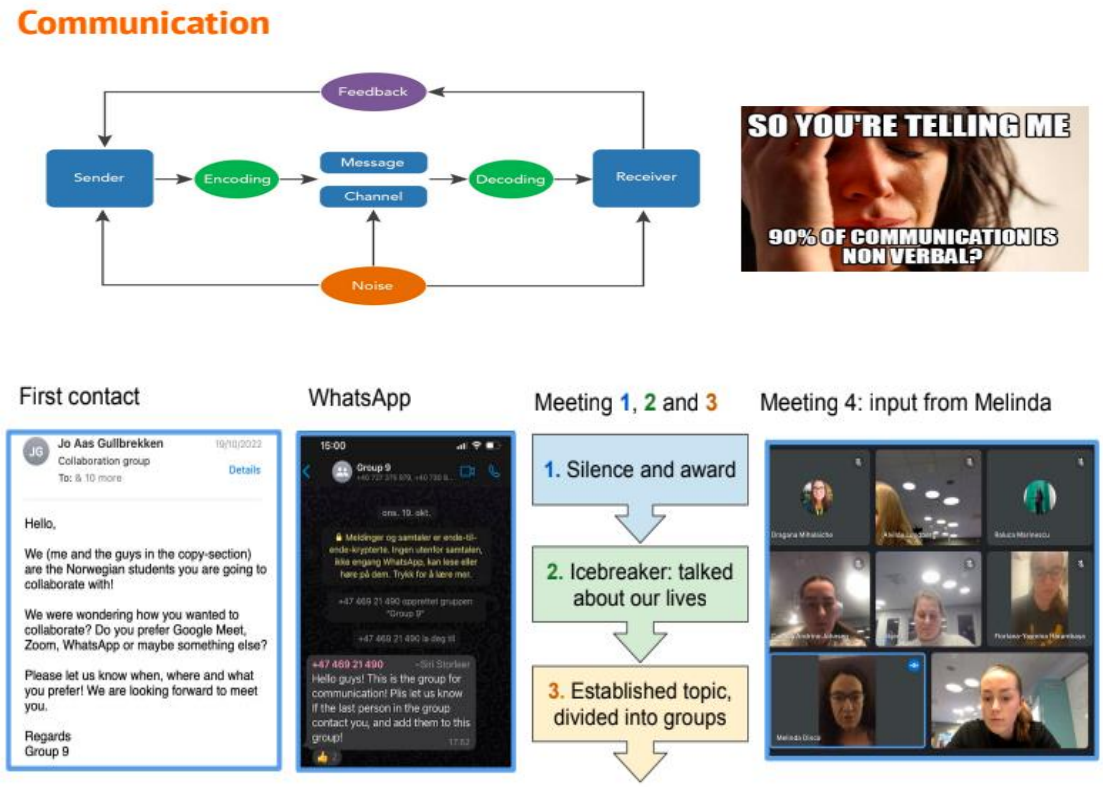


***Figure 28**. Students reflections` on the communication processes, as they are revealed in the students project presentation*

TEAMWORK

Contemporary societal transformations have had a pervasive impact on the way professional and personal activities are carried out. Therefore, the performance of activities in a team has become an essential competency that requires significant attention from the perspective of both individual contributions and task execution, as well as from the perspective of shaping social actors' behavior. The readiness to delegate responsibilities, focus on specific objectives, integrate feedback, and model behavior according to new rules at the level of work teams or collectives are some of the benchmarks that must be considered to develop teamwork skills.

In this regard, we also directed our attention towards the way teamwork skills are perceived, practiced and valued, as well as towards individuals' self-assessment regarding their competence level of teamwork skills. We examined the importance given to teamwork skills development, which was reflected in the centralization of answers to the question, "*Collaboration/teamwork skills are important to me?*" Participants were given five options to choose from, where 1 indicated "strongly agree" and 5 indicated "strongly disagree."

Analysis of the responses revealed that, at both the beginning and end of the team-based learning activities, the participants of the study placed significant importance on their ability to work in a team. Although the level of importance remained very high at both evaluation moments, a slightly higher importance was given at the initial evaluation (M = 4.56, SD = 0.5) compared to the final evaluation (M = 4.50, SD = 0.56) (Figure 29). Nevertheless, the statistical analysis indicated no significant differences between the participants' ratings of importance regarding teamwork skills.

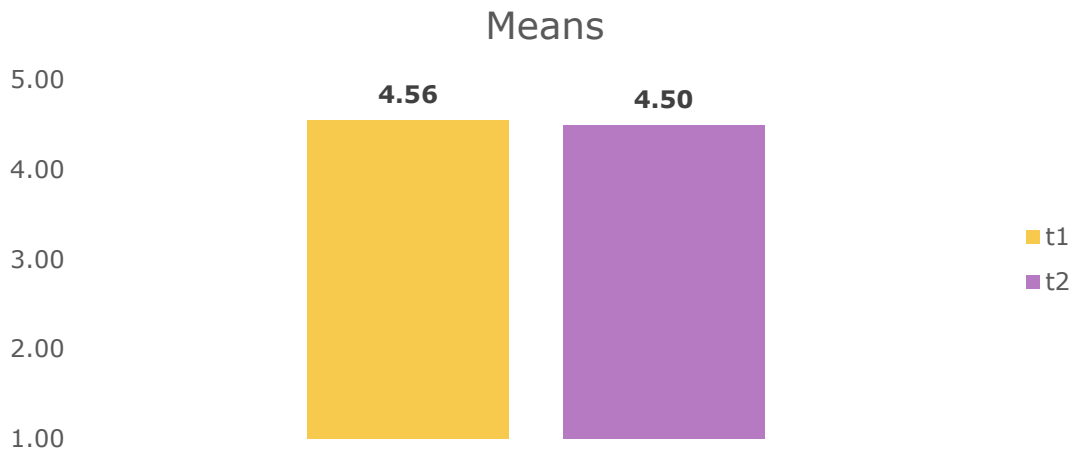


***Figure 29**. Communication skills before and after the course (all participants)*

In order to provide a comprehensive image of the importance assigned to teamwork skills, a breakdown analysis was conducted for each group of participants from each university, as illustrated in Figure 30. The Mann Whitney test on independent samples was employed for this analysis. The results indicated that irrespective of the university of origin, a high level of interest was expressed by the participants for the development of teamwork skills, as evidenced in Table 14. Furthermore, the interest of participants from both universities remained high throughout the course, participant students emphasizing the need to cultivate their teamwork skills, both at the beginning and upon completion of the learning activities carried out in cross-cultural and cross-disciplinary learning context of the UVT-NTNU joint course. These findings shows the significance of teamwork skills in contemporary society and highlight the relevance of efforts to enhance such competencies among professionals.

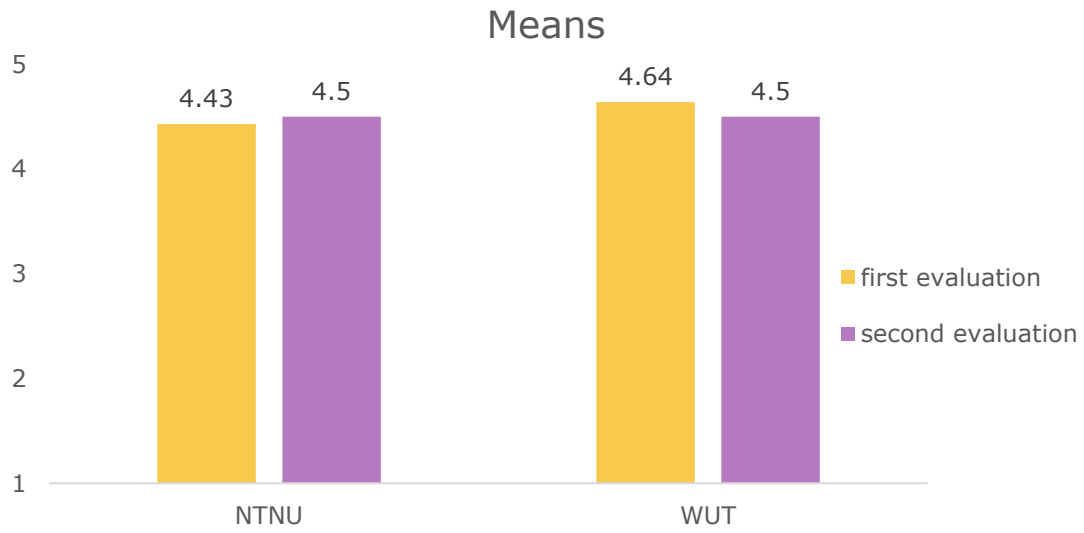


Figure 30. *Communication skills before and after the course (NTNU and UVT)*

Table 14. *The Mann Whitney test for teamwork skills by university of origin*

		Univ.	n	Mean Rank	U	Z	p
First evaluation	Teamwork	NTNU	14	16.21	122	-1.206	.228
		UVT	22	19.95			
Second evaluation	Teamwork	NTNU	14	18.25	150.5	-.130	.89
		UVT	22	18.66			

Similar to the process of evaluating the importance given to teamwork skills, the study participants were invited to self-assess their collaborative and teamwork skills actual level of competence. Thus, the self-evaluation was carried out at the beginning and at the end of the co-working and learning activities in cross-cultural and cross-disciplinary virtual classroom of the UVT-NTNU Joint Course. The possible differences that could appear between the moment of the initial evaluation and the moment of the final evaluation represent the elements of creative tension.

These elements of creative tension can constitute the internal source motivation and active involvement in the process of learning and developing their teamwork skills. In order to identify possible differences between the two moments of the self-assessment, respectively to observe if there are elements of creative tension regarding the teamwork and collaborative competencies, the Wilcoxon test for sample pairs was used.

The analyzed results shows that after concluding the learning activities in cross-cultural and cross-disciplinary context of the UVT-NTNU Joint Course, in the second moment of the teamwork skills self-assessment, the participants obtained lower scores compared to the initial self-assessment. The significant statistical differences highlight the existence of elements of creative tension. These elements of creative tension are the results of the highly involvement in the reflective learning process regarding and developing an in-depth understanding of their individual teamwork skills level in the novel learning context of cross-cultural and cross-disciplinary setting. The impact of the students' involvement in effective interactions of learning and working in teams at the joint course on the self-assessment results is of strong intensity (r = 0.69).

The differentiated analysis of study participants according to their university of origin reveals statistically significant differences between the two assessments of teamwork skills for students from UVT, but not for NTNU students. This suggests that UVT students experienced creative tension and moments of introspection, leading to increased awareness of the need to develop their teamwork skills. The effect of participating in team activities on self-assessed competencies was very strong (r = 0.78) for WUT participants.

Table 15. *Paired sample Wilcoxon test for teamwork skills, creative tension*

	Creative tensions				
Teamwork	My actual (T1)	My actual (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3,97	3,19	-0,78	-4,149	0,000
NTNU	3,86	3,50	-0,36	-1,89	0,059
UVT	4,05	3,00	-1,05	-3,656	0

The study found that the self-perception of teamwork skills was not influenced by the study programs attended by participants (Table 16). Both STEM and non-STEM students rated their competence level as demanding, indicating the presence of creative tension regardless of their study program specifics. However, interactive, interdisciplinary, and intercultural experiences had different effects on self-perception of teamwork skills between the two categories of students. The effect size was very strong (r = 0.77) for non-STEM students, but only strong (r = 0.55) for STEM students. This suggests that non-STEM students were more aware of the need to develop teamwork skills compared to STEM students. Although both fields of study show similar needs for developing teamwork skills, the presence of creative tension is more frequent in non-STEM fields.

We also investigated whether gender differences existed in the experience of creative tension. Both male and female respondents reported experiencing creative tension, suggesting that improving teamwork skills is an opportunity for all participants regardless of gender. Similar to other dimensions, the second evaluation revealed a higher level of self-awareness and a more realistic perception of their competence levels, indicating the presence of creative tension. However, the intensity of interdisciplinary and intercultural experiences had a different impact on male and female students. The experiences had a very strong influence (r = 0.78) on the self-perception of teamwork skills for male respondents, compared to a strong influence (r = 0.66) for female respondents. In summary, while both male and female participants recognized the need to improve teamwork skills, male respondents showed a slightly stronger need for improvement than female respondents.

Table 16. *Wilcoxon test for teamwork skills by field of study (STEM and non-STEM) and gender*

	Creative tensions				
Teamwork	My actual (T1)	My actual (T2)	Differences	Score z (ranks)	Sig. (2-tailed)
Field of science					
STEM	3,87	3,47	-0,40	-2,121	0,034
Non-STEM	4,05	3,00	-1,05	-3,531	0,000
Gender					
Female	4	3,25	-0,75	-3,216	0,001
Male	3,92	3,08	-0,84	-2,714	0,007

To provide a more complete understanding of teamwork skills, in addition to analyzing creative tension, we also used the Self-assessment Transversal Skills Questionnaire (STSQ). This tool was administered both at the beginning of the cheese-making activity and at the end of the course activities. Table 17 presents the descriptive statistics for self-assessed competencies at the beginning and end of the training activity.

Table 17. *Descriptive indicators for the teamwork skills measured with STSQ questionnaire (before and after the course)*

Teamwork	N	Min.	Max.	Mean	Std. Dev.
Moment of evaluation					
before course	39	3.40	5.00	4.15	0.42
after course	39	1.00	5.00	4.08	0.68
NTNU					
before course	19	3.40	5.00	4.01	0.40
after course	19	1.00	5.00	3.92	0.81
UVT					
before course	20	3.,60	5.00	4.29	0.40
after course	20	3.60	5.00	4.24	0.49

The analysis of the responses provided by the study participants highlights that the experience of the activities carried out during the course, the interaction with team members, the intercultural and interdisciplinary nature of the course contributed to an increase in the level of self-assessment of teamwork skills at the end of the training activity compared to the initial assessment. The decrease in the level of self-perception could reflect a more realistic assessment of one's own skills in working in a team, as it is known that initial assessments tend to overestimate subjective levels of competence. Despite the differences in the self-assessment between the two moments, the results of the Wilcoxon test for paired samples (Table 18) demonstrate that there are no statistically significant differences, indicating that any differences in self-perception are situational and do not reflect an influence that may have occurred during the course activities on the skills to work in a team. In other words, the results obtained from the STSQ show that the study participants similarly evaluated their level of teamwork skills both at the beginning and at the end of the course activities.

Table 18. *Wilcoxon test for teamwork skills by moment of evaluation*

	teamwork skills				
	before course	after course	Differences	Score z (ranks)	Sig. (2-tailed)
All	4.15	4.08	-0.27	-0.068	0.946
NTNU	4.01	3.92	-0.26	-0.365	0.715
UVT	4.29	4.24	-0.28	-0.344	0.731

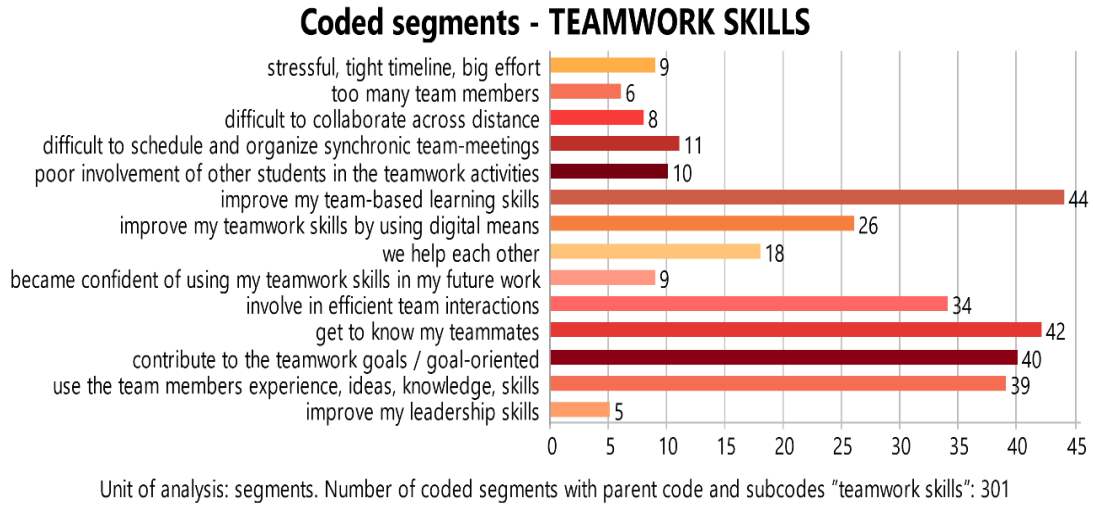


Figure 31. *Coded segments – Reflective journal. Teamwork skills*

Most of the coded fragments from the responses to the open-ended question "Reflective journal" expressed the students` thoughts, plans and emotions regarding their *teamwork skills* during the transnational learning activities of the UVT-NTNU joint course. There have been identified 301 text-segments in which students have shared their experiences from the team-based activities in cross-cultural and cross-disciplinary learning context. The code system statistics presented in Figure 31 show the absolute frequency of text-segments directly referring to the teamwork skills.

The *teamwork skills* code relations hierarchy analysis shows that the reflections of students who report on how they *practice their teamwork skills* are often associated with the following activities:

- Reflect and learn from the students of partner university,
- Reflect on how they learn in this particular team-based, cross-cultural and cross-disciplinary learning context,

- Be actively involved in the communication and efficient team-work interactions with students and teachers from both partner universities,
- Get to know their teammates,
- Use the cross-cultural composition of their team,
- Act being goal-oriented, but also enjoy the learning process and stay actively involved in the cross-cultural collaborative learning activities,
- Most of the students reflecting on their team-based learning skills also revealed emotions like: interesting, exciting, enthusiastic, creative mood.

The students' reflections explain the difficulties they confronted, especially in the first phase of the collaborative activities (T1 - Teambuilding phase). They not only list these barriers in integrating in their team, but they described various solutions they adopted to accelerate the teambuilding process and to increase the effective workflow in their team-based transnational collaborative learning activities:

- Objective and technical obstacles, when students find it difficult to manage the digital infrastructure to schedule and organize the synchronic team-meetings, or to install the virtual reality devices and make it work properly.

"*It is hard to work with VR since the technology needs to be improved. It is also tricky to keep the whole group engaged since you don't have physical contact*." (NTNU student, male, 24 years old, VR, T1)

"*We have also organized meetings outside of our established meetings on every Wednesday to talk about the project. For example, special meetings in VR workrooms so we can try it together.*" (UVT student, female, 21 years old, VR, T2)

"*Thus far we've created a Google Classroom and utilized VR workrooms to get to know each other.*" (NTNU student, male, 23 years old, VR, T1)

- Poor involvement of some students who were not able to be actively involved in the lectures or who have no real interest in participating in the team-based learning activities, and were eliminated after the first phase of the learning process.

"*It's a bit disappointing the fact that not everyone can fully participate while we organize [synchronic, independently from the lectures schedule] meetings*." (UVT student, male, 22 years old, VR, T1)

"*Some of the Romanian students seem less motivated to join in on the discourse surrounding the project, but luckily the remaining students were able*

to pick up the pieces and carry us to victory." (NTNU student, male, 26 years old, non-VR, T2)

- A big effort needed to transform new-formed groups of students into performing collaborative teams.

"*Wish we could use more time to gain trust in each other, since it still feels like nobody really knows each other in the group*." (NTNU student, male, 21 years old, non-VR, T1)

"*It is a challenging teamwork by facing new people, new projects, having no big expertise on the project subject, with a long distance collaboration within a short timeline. It feels like being out of my comfort zone on each level*." (UVT student, female, 41 years old, non-VR, T2)

"*We are a diverse group of students with limited introduction to each other, making direct cooperation difficult. The joint time available for meetings is small, so we cannot afford to backtrack. Given a new chance, we should have played games to get to know each other*." (NTNU student, male, 21 years old, non-VR, T3)

The students reflect on their teamwork skills during the entire learning process. From the start, when students' reflections were collected in the first phase of the learning process (T1 - Teambuilding phase), most of their self-assessment shows confidence in their high level of competence in teamwork skills. Some explain their positive self-image about being very competent in teamwork skills by the long experience of learning in a collaborative way, in study groups. Others consider that teamwork skills are very easy to achieve when one has the self-perception of being open and having social skills. Thus, many students assume their high level of competencies in teamwork skills and start to use it as a valuable resource in building an effective common workspace for their team, helping other students to better integrate in the team-based activities, and being actively involved in transforming the newly formed group of students into a working team.

Following the students self-assessment of their level of competence in teamwork skills during the second and the final phases of the learning process (T2 - Teamwork phase and T3 - Team Performance phase), it can be observed that in many cases, the students tend to self-assess their teamwork skills with more moderation, and their reflective journals reveals detailed explanations for this decreased self-assessed level of teamwork skills. What happened? Some students realized that having social skills and being enthusiastically involved

in team-based activities is not enough to build trustful relationships between teammates and to make a team properly work to achieve its goals.

Some others consider their good competencies in teamwork skills were achieved in controlled teamwork settings, with important premises they do not have in this particular course and which will not to be granted in a real-working context. For example, working with people you never meet before and whom are coming in the common workspace not only with their own personality, values, interests and professional competencies, but also with a different cultural background is quite a challenge for students because they were used to take part in culturally homogenous and mono-disciplinary study groups.

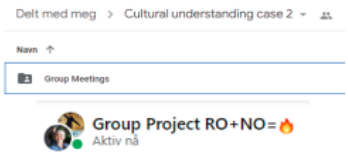
Finally, the same mentioned challenges – *the cross-cultural and cross-disciplinary of the students' team composition* - were appreciated by the participant students as being the critical points that push them to practice and work more in order to develop their teamwork skills.

> "*As the days go by I am working on my communication skills and teamwork skills.*" […] "*I am confident in my team and learn more about myself.*" (UVT student, female, 19 years old, non-VR, T1)
>
> "*I find it interesting that we can work in a team with students from another country, that we can express our opinions without being judged, that we each show our own unique skills and area of competence, helping each other.*" (UVT student, female, 20 years old, VR, T2)
>
> "*It has been hard to work with the students from Romania, but I feel that now we are reaching common ground. I think it just took a while to really get to know each other and understand the group dynamics and how to operate together. We from Norway are so used to working in groups that we typically took over the entire conversation at first.*" (NTNU student, no binary, 24 years old, non-VR, T2)
>
> "*It is nice working with foreign students from different countries, but at some time the collaboration might not be as effectively as working with Romanian students*" (UVT student, female, 22 years old, non-VR, T2)
>
> "*It takes more time than collaborating with students in Norway.*" (NTNU student, female, 21 years old, non-VR, T3)

Additionally to their individual reflections, students make group reflections on their practice of collaboration and teamwork skills. Some examples of such group reflections were captured and presented by the students in the final project presentation and could be seen in Figure 32.

Collaboration and Platforms

- Google Meet
- Google Drive
- Facebook Messenger



Participatory Rules:

- Core time for collaboration is 16:00-20:00 on Wednesdays
- Ad-hoc meeting time agreed on within a 24 hour time slot
- If you can't attend, notify the team in the chat group
- Camera should always be on in meetings
- Participate in discussions, and give and get constructive feedback with a smile

The collaboration

Norwegian students impression

Romanian students impression

- Communication channel
  - Whats app
  - Google Meet
  - Google docs
- Who took charge?
- Democratic chosen theme
- Brainstorming
- 6 advice for developing a good collaboration

Difficulties associated with collaboration

- Used to different digital platform
- Do's and dont's
- Different day-to-day schedules
- Making a meeting agenda
- Sporadic attendance
- Equal understanding of the task
- "Too many cooks spoil the broth"

***Figure 32**. Examples of group reflections on the collaboration and teamwork skills practiced in the Classroom Laboratory UVT-NTNU Joint Course*

CULTURAL UNDERSTANDING

The analysis of the learning process in a cross-cultural and cross-disciplinary context necessarily involves paying attention to the way in which the study participants possess the skills to understand the differences and similarities of their cultural and educational background, to decode and understand messages received from people or groups belonging to other social and cultural contexts. Therefore, the study participants were asked to self-assess the importance they give to the practice and development of their cultural understanding competencies. They had the possibility to choose between five answers, where 1 denotes strongly agree, and 5 denotes strongly disagree. The average of the answers given by the study participants (as shown in Figure 33), both at the time of the initial evaluation and after the completion of the training activities in which they participated, highlighted a high level of importance assigned to this type of learning. There were no statistically significant differences between the two evaluation moments, and the importance given to this learning component in the second moment of the evaluation registered a slightly more limited value compared to the initial moment. This slight decrease could be attributed to the fact that, before the start of the course and the intercultural and interdisciplinary activities, the importance was perceived as higher. However, after the actual activities and the study participants realized that cultural differences were not extremely divergent, they assigned a slightly more limited importance to this component of the learning process.

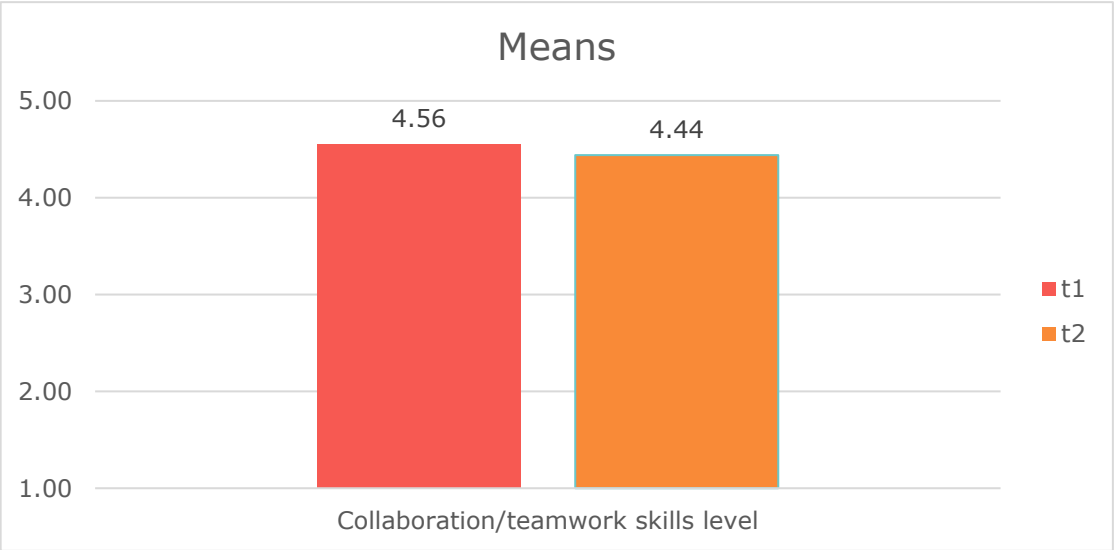


***Figure 33**. Cultural understanding skills before and after the course (all participants)*

To obtain a comprehensive understanding of the participants' competences in intercultural understanding, a differentiated analysis was conducted on how the two groups of students assessed their competency levels. The participants were grouped based on their university of origin and their skills were evaluated at the beginning and end of the training activity. The Mann-Whitney test for independent samples was used to analyze the data.

Table 19. *Cultural understanding skills by university*

		Univ.	n	Mean Rank	U	z	p
First evaluation (before the course)	Cultural understanding competencies	NTNU	14	14.29	95	-2.037	.057
		UVT	22	21.18			
Second evaluation (after the course)	Cultural understanding competencies	NTNU	14	16.29	123	-1.099	.327
		UVT	22	19.91			

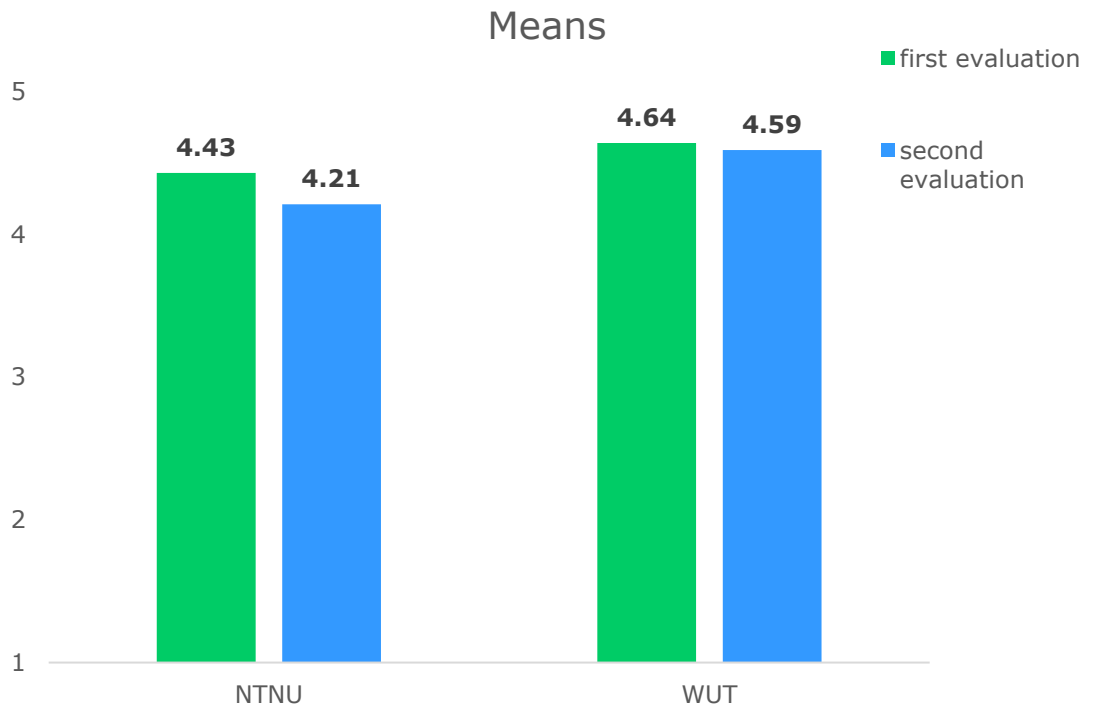


Figure 34. *Cultural understanding skills before and after the course (NTNU and UVT)*

The results of the Mann Whitney test indicate that study participants rated their intercultural learning skills similarly, both at the time of the initial evaluation and at the end of the training activity. This means that there were no significant statistical differences in how UVT students and NTNU students

initially evaluated, and how they evaluated their self-assessed intercultural learning skills at the end of the training activities. However, it should be noted that in both evaluation moments, students from both universities rated their intercultural understanding skills at a high level, approaching the maximum values of the scale (Figure 34).

To identify potential elements of creative tension, the study participants were asked to self-evaluate their level of competence in terms of intercultural understanding. We used the Wilcoxon test for paired samples to identify significant differences between the self-evaluation scores between the two moments. The analysis results for the entire study participant group confirm the presence of significant statistical differences between the two evaluation moments, indicating the existence of creative tension elements (Table 20). Initially, the self-assessment of intercultural understanding skills showed a slightly higher level, but in the second moment, after a series of interactions with colleagues from different cultural contexts, the level of self-assessment decreased slightly. This situation can constitute a reflective learning moment regarding one's own intercultural understanding skills and can stimulate the development of these skills. The size of the effect generated by participating in the course activities, working in intercultural teams, on the participants' evaluation of their competences in the second moment of the evaluation is of medium intensity ($r = 0.43$). In other words, as a result of interactions between team members in completing tasks, the level of self-evaluation of intercultural understanding skills changed to a moderate degree, with elements of creative tension present but without generating significant changes in the way the study participants interact with people from other cultural contexts.

With regards to the university of origin, we note that between the two moments of self-evaluation there are no significant differences from a statistical point of view in the case of students affiliated to NTNU, the level of self-perception of intercultural understanding skills still exceeding the average value of the measurement scale. On the other hand, for students attending the training activities at UVT, significant differences were recorded from a statistical point of view between the two moments of self-evaluation. This suggests that UVT students may have either overestimated their level of competence in intercultural understanding during the initial assessment or became more demanding when they assessed their level of competence during the second assessment. Nonetheless, it is certain that the elements of creative tension observed in the case of UVT students will contribute to a better understanding and perception of their own skills of intercultural understanding in future moments.

Table 20. *Paired sample Wilcoxon test for cultural understanding skills, creative tension*

Cultural understanding	Creative tensions				
	My actual (before the course)	My actual (after the course)	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.78	3.31	-0.47	-2.581	0.010
NTNU	3.43	3.14	-0.29	-1.414	0.157
UVT	4.00	3.41	-0.59	-2.144	0.032

In relation to the study programs attended, it can be observed that there were no statistically significant differences between the two evaluation moments of the level of self-definition of intercultural understanding skills in the case of students attending study programs in the STEM curriculum area. On the other hand, in the case of students following study programs in the non-STEM area, statistically significant differences were observed between the self-evaluations of the two moments, which naturally indicate the appearance of elements of creative tension. In this case, the magnitude of the effect generated by the participation in intercultural work teams on one's own level of definition of intercultural understanding is of medium intensity (r = 0.43), without indicating that considerable structural changes were generated in the level of self-definition in terms of intercultural understanding.

Regarding the gender criterion, we observed that there were no significant differences in the self-perceived level of intercultural understanding among male respondents in the two moments of evaluation. This suggests that male participants maintained a consistent level of self-definition with regard to their intercultural understanding skills, despite working in intercultural teams during the training.

However, in the case of female respondents, we noted statistically significant differences between the two moments of evaluation, indicating the presence of elements of creative tension. Through their interactions in mixed teams, female participants became more reflective about their intercultural understanding skills, which had a positive impact on their ability to understand and work with people from other cultural backgrounds.

It is worth noting that the course experiences had a strong influence (r = 0.55) on the way in which the students defined themselves during the second evaluation of their intercultural understanding skills.

Table 21. *Wilcoxon test for cultural understanding skills by field of study (STEM and non-STEM) and gender*

	Creative tensions				
Cultural understanding	My actual (before the course)	My actual (after the course)	Differences	Score z (ranks)	Sig. (2-tailed)
Area of science					
STEM	3.53	3.20	-0.33	-1.667	0.096
Non-STEM	3.95	3.38	-0.57	-1.99	0.047
Gender					
Female	3.92	3.33	-0.59	-2.675	0.007
Male	3.5	3.25	-0.25	-0.791	0.429

In addition to the aforementioned questionnaire that facilitated the identification of elements of creative tension, the Self-assessment Transversal Skills Questionnaire (STSQ) was also employed in assessing intercultural understanding in the participants of the study. The purpose of including Table 22 was to better understand the nuances of how the participants engaged with the concept of intercultural understanding. Table 22 showcases the descriptive statistical indicators recorded during the initial and final self-evaluations, corresponding to the students' commitment and their involvement in the course activities.

Table 22. *Descriptive indicators for the cultural understanding skills measured with STSQ questionnaire (before and after the course).*

Cultural understanding	N	Min.	Max.	Mean	Std. Dev.
Moment of evaluation					
T1	30	3.00	4.80	3.8533	.54313
T3	30	2.40	4.20	3.1867	.36741
NTNU					
T1	14	3.00	4.40	3.6143	.43298
T3	14	2.80	3.80	3.1571	.31553
UVT					
T1	16	3.00	4.80	4.0625	.55483
T3	16	2.40	4.20	3.2125	.41613

The examination of the scores achieved at the two assessments reveals that, at both the whole group and university levels, the second evaluation of intercultural understanding skills recorded more modest values than the initial evaluation. This phenomenon can be attributed to the cultural interaction endeavors that transpired during the course, where the participants engaged in team activities that facilitated a heightened awareness of their own intercultural understanding capabilities.

To determine the statistical significance of the differences between the two evaluation moments, we used the Wilcoxon test for paired samples. The analysis reveals significant differences, indicating that participants' level of demands during the second evaluation of intercultural understanding was higher. This may be attributed to the experiences gained during the course, including teamwork and interactions with peers. The obtained results are reproduced in table 23.

Table 23. *Wilcoxon test for teamwork skills by moment of self-evaluation*

	Teamwork skills				
	before the course	after the course	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.8	3.3	-0.5	-5.023	0.000
NTNU	4.4	3.8	-0.6	-3.542	0.000
UVT	4.8	4.2	-0.6	-3.671	0.000

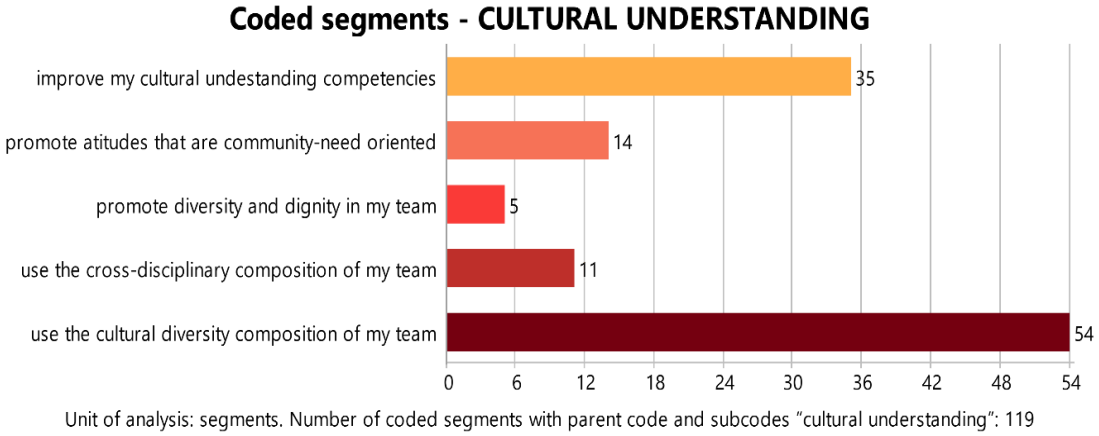


Figure 35. *Coded segments – Reflective journal. Cultural understanding competencies*

Half of the students expressed their thoughts and self-reflections in their reflective journal referring directly to the *cultural understanding of multinational*

working relations skills. The code system statistics presented in Figure 35 shows the absolute frequency of the text-segments revealing experiences and thoughts about the cross-cultural composition of the students' teams and about ways of improving the students' cultural understanding skills.

The *cultural understanding* code relations hierarchy analysis shows that student reflections on how *to use the cross-cultural composition of their team* are associated with the following activities:

- Reflect on the novelty of the learning setting of the UVT-NTNU joint course and how the students learn in terms of collaboration across distances with students, teachers and local experts from Romania and Norway,
- Reflect on how they feel comfortable in communication, feeling free to express their thoughts, ideas, opinions and being actively involved in communication,
- Reflect on how the cross-cultural composition of their study group motivate and improve their teamwork skills and their cultural understanding of work relations,
- Feel confident and content with how the UVT-NTNU joint course meets their expectations and generally, feel enthusiastic and interested during the team-based learning activities.

"*A particular skill I mainly want to develop is being able to cooperate with a group of people with a different background in a different country using a different language. I believe it will be very useful to gain such experience and develop this type of skill in future work, because we live in an ever increasing globalized community.*" (NTNU student, male, 24 years old, non-VR, T1)

"*One takes for granted that people will share the same prerequisites when cooperating but from what I've already seen, there is a huge difference in the way people even on the same continent behave and think. Cultural norms and rules set a really different basis for collaboration.*" (NTNU student, male, 23 years old, VR, T1)

"*I think it is good to work in interdisciplinary groups to learn more and especially with students from other cultures. [To] see things from multiple perspectives.*" (NTNU student, male, 21 years old, VR, T2)

"*I learned a lot about Norwegian culture and about the education system in Norway, but also about the educational system in Romania because I had to contact specialists in the field. This cultural exchange was very interesting and I hope to participate in more projects like this in the future.*" (UVT student, female, 20 years old, non-VR, T3)

Moreover, the students attending the Classroom Laboratory UVT-NTNU Joint Course reflected on their cultural understanding of international working relations and their group reflections resulted in the final project presentation, as could be seen in Figure 36.

***Figure 36**. Examples of students group reflections on the cultural understanding influence on the learning activities of the UVT-NTNU Joint Course.*

DIGITAL SKILLS

The learning context within cross-cultural and cross-disciplinary across distances and using exclusively digital tools and open educational resources cannot be dissociated from the digital skills of the students engaged in the learning process. Given that training activities, learning materials, communication and interaction platforms became operational and could be used as educational resources only with a minimum level of digital proficiency, we endeavored to examine certain facets related to the digital competencies of

the participants in the interactive course arranged for students from two partner universities.

The present study aimed to explore the significance attributed by the group of participants in learning activities to digital skills, both at the onset of initial activities and upon the entire process. It is noteworthy that the self-evaluations recognized the indispensability of these competencies, irrespective of the timing of the evaluation. However, it is pertinent to mention that upon completion of the cross-cultural and cross-disciplinary learning activities, the perceived importance accorded to digital skills recorded slightly increased values (M = 4.64, SD = 0.54) in comparison to the initial evaluation (M = 4.53, SD = 0.73), although these differences did not rich a statistical significance.

In order to identify significant differences by the university of origin of the participating students, we employed the Mann Whitney test for independent samples, given that the two variables in question did not meet the requirements for a normal distribution. The analysis of the differentiated importance accorded by the students of the two universities to digital competencies revealed that during the initial evaluation, students from UVT attributed a higher level of importance to digital competencies in comparison to their counterparts from NTNU, with the differences in importance assigned by the two groups of students being statistically significant. In other words, during the initial evaluation, students from UVT perceived digital competencies to be more crucial for the learning activities as opposed to students affiliated with NTNU. At the time of the final evaluation digital competencies were deemed to be more important than at the beginning of the training activities, without notable differences between the two groups of students (see Table 24).

Table 24. *Table 24 Mann Whitney test for independent samples Digital skills*

		Univ.	n	Mean Rank	U	z	p
First evaluation (before the course)	Digital skills	NTNU	14	13.96	90.5	-2.432	.038
		UVT	22	21.39			
Second evaluation (after the course)	Digital skills	NTNU	14	15.00	127	-1.066	.39
		UVT	22	20.73			

Following their initial expression of views on the importance of digital competencies, study participants were subsequently challenged to assess their own level of digital competence. This evaluation was conducted both at the

onset of the training activities and at the culmination of the training process. The differences between the two evaluation moments comprise the creative tension elements that would constitute resources for the development of their skills through introspective moments that gauge their actual level of digital skills. As such, statistically significant differences were observed between the two moments of self-evaluation at the group level, indicating that the creative tension identified at the group level could potentially generate a rejuvenation element and improve the level of digital skills in the group. However, the impact of participation in the course, involvement in team tasks, interaction with colleagues, and comprehension of the intercultural contexts had a comparable effect on their self-assessment of competencies, with an effect size of moderate intensity (r = 0.42).

According to the statistical analysis conducted on each group separately, there were no significant differences observed between the two moments of self-evaluation for NTNU students. As a result, it cannot be asserted that creative tension elements were generated, despite a slightly lower level of self-perception of digital skills being reported during the second evaluation, as compared to the initial evaluation. Conversely, the results related to the self-perception of digital skills for UVT students indicated statistically significant differences between the two evaluation moments, implying the presence of creative tension elements. This finding suggests that UVT students possess the potential to improve their level of digital skills, as long as they are willing to reflect objectively and evaluate their own level of competence. The effect size generated by the course activities, interactions, and group tasks on the self-assessment of competence for this group is of medium intensity, with a correlation coefficient of 0.49 (r = 0.49).

Table 25. *Paired sample Wilcoxon test digital skills, creative tension*

	Creative tensions				
Digital Skills	My actual level (before the course)	My actual level (after the course)	Differences	Score z (ranks)	Sig. (2-tailed)
All	4,00	3,69	-0,31	-2,517	0,012
NTNU	4,07	3,93	-0,14	-1	0,317
UVT	3,95	3,55	-0,41	-2,31	0,021

In the context of students enrolled in non-STEM study programs, the peculiarities of their field of study were found to be significant when self-assessing their level of digital skills. The results indicated significant statistical

differences between the two evaluations, with the assessment scores being lower in the second assessment. These findings suggest that non-STEM students experience more intense elements of creative tension, which can lead to an improvement in their digital skills. In other words, this group of students has the potential to enhance their digital skills through reflective self-evaluation. The participation in course activities, interdisciplinary and transcultural work teams had a strong effect (r = 0.50) on the way in which these students evaluated their own digital skills. With regard to gender, the analysis of the data revealed that it did not influence how the participants evaluated their level of digital skills, either at the beginning or at the end of the training activity.

Table 26. *Wilcoxon test for digital skills by field of study (STEM and non-STEM) and gender*

	Creative tensions				
Digital Skills	My actual level (before the course)	My actual level (after the course)	Differences	Score z (ranks)	Sig. (2-tailed)
Area of science					
STEM	4,07	3,93	-0,14	-1	0,317
Non-STEM	3,95	3,52	-0,43	-2,31	0,021
Gender					
Female	3,75	3,50	-0,25	-1,732	0,083
Male	4,5	4,08	-0,42	-1,89	0,059

In order to provide a more comprehensive analysis of the digital skills possessed by the students who participated in the selected course, we utilized the Self-assessment Transversal Skills Questionnaire (STSQ) tool to assess their proficiency levels. The DS STSQ table displays the statistical indicators calculated for the entire group of study participants as well as for the individual groups of students from each university, both at the outset of the course and upon completion of the training activities. A preliminary examination of the table reveals that the scores obtained by the study participants in the second evaluation appear to be slightly higher than those obtained in the initial assessment. To determine whether these differences are statistically significant, we conducted a Wilcoxon test for paired samples.

Table 27. *Descriptive indicators for the cultural understanding skills measured with STSQ questionnaire (before and after the course).*

Digital Skills	N	Min.	Max.	Mean	Std. Dev.
Moment of evaluation					
before the course	39	2,83	5,00	3,9957	,51083
after the course	39	1,67	5,00	4,0769	,64078
NTNU					
before the course	19	2,83	4,67	3,7982	,41788
after the course	19	1,67	4,83	3,9035	,65573
UVT					
before the course	20	3,00	5,00	4,1833	,52954
after the course	20	2,83	5,00	4,2417	,59598

Upon initial observation, it is apparent that the scores obtained by the participants at the second moment of evaluation appear to be slightly higher than those obtained during the initial evaluation. However, to ascertain whether these differences are statistically significant, the Wilcoxon test for paired samples was employed. The statistical analysis reveals that, both for the entire group and for each university separately, there were no significant differences between the two evaluation moments. This implies that the experiences gained during the training course, interactions within work teams, and involvement in related tasks did not significantly alter the way the participants evaluated their digital skills. This finding could be attributed to the fact that participation in the course necessitated a minimum level of expertise in digital communication.

Table 28*. Wilcoxon test for digital skills by moment of evaluation*

	Digital skills				
	before the course	after the course	Differences	Score z (ranks)	Sig. (2-tailed)
All	3.9	4.07	-0.17	-1.341	0.180
NTNU	3.79	3.90	-0.11	-1.302	0.193
UVT	4.18	4.24	-0.06	-.600	0.548

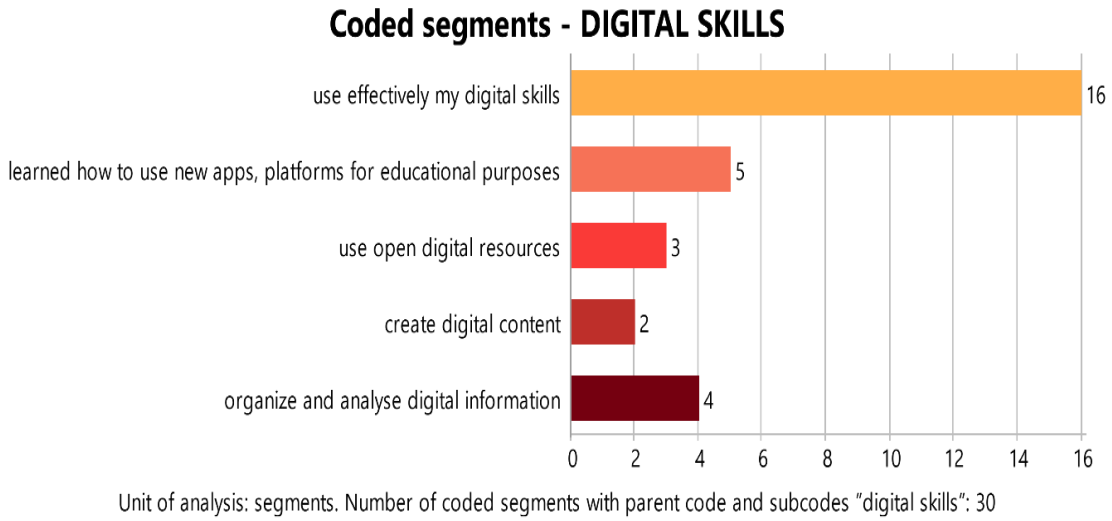


Figure 37. *Coded segments – Reflective journal. Digital skills*

Being a precondition to attend the Classroom Laboratory UVT-NTNU Joint Course, most of the students are confident in their high level of competence in *digital skills* already at the start of the learning activities. The larger context is that students are used with open educational resources, digital tools and platforms for learning. This explains the small number of responses in the students' Reflective journals (22 from 127) and only 30 text-segments directly referring to the *digital skills*, as could be observed in Figure 37.

The *digital skills* code relations hierarchy analysis shows that student reflections on how *to use effectively their digital skills* are associated with the following activities:

- Reflect on the lectures and team-based activities setting in virtual classrooms.
- Become aware on how the digital environment is a precondition for this course setting.
- Involve in efficient team interactions and improve their communication and teamwork skills by using digital means.

Some students affirms that they gained confidence in using digital platforms and tools for communication and collaboration across distance during the COVID-19 pandemic, this being a big advantage for the current course setting entirely in virtual classrooms:

> *"About the communication over the Internet and by using different digital programs to collaborate, I feel we have learned about this through the COVID-19 time. That is a big advantage, and I did not feel any stress for that part. If this course was in 2019, I would maybe have been a bit more stressed about that."* (NTNU Student, female, 28 years old, non-VR, T1)

"*Earlier, during the COVID-19 pandemic, many school projects required digital cooperation without being in the same room. In that period I believe mine and most others' digital skills were greatly improved.*" (NTNU student, male, 20 years old, non-VR, T1)

"*I think VR is an amazing way to bridge the 3k Km distance between us and we've used it quite effectively.* " (UVT student, male, 19 years old, VR, T3)

"*This course has taught me a lot about collaboration by digital means, in the sense that we used diverse methods of communication and file sharing to put together our work.*" (UVT student, male, 21 years old, VR, T3)

The digital platforms and tools used in the team-based learning activities to communicate and collaborate across distances are presented by the students in their final project presentation. Some of these project presentations' fragments are listed below, in Figure 38.

VR Workrooms

VR meetings a thicker form of communication

- More similar to face to face, but still missing expressions
- With a whiteboard and hand movements it was much less misinterpretation and therefore much less time spent on troubleshooting
- Reduced time needed to get to know each other
- With workrooms you can also join via phone or pc
  - Not as immersive

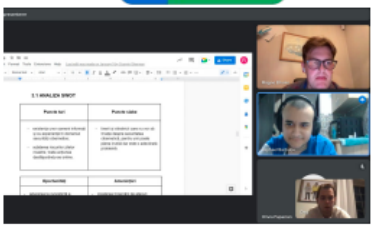
Barriers:

- Technical issues
  - Wrong VR headset, and startup
- Experienced a lot more noise on this platform
  - because it was more informal
- The ones who did not attend VR meetings fell out of the group

Google Meet

Low threshold Video meetings

- Most people are familiar with Google Meets
  - Easy to use: can join from your phone or computer



Barriers

- The platform felt very formal, this lead to not everybody wanting to take the word.
- It is also a platform that without moderator, the person speaking loudest controls the conversation

Google Drive

- Structuring the work
  - Individual folders
  - Delegate tasks/feedback

- Sharing documents
  - Sources

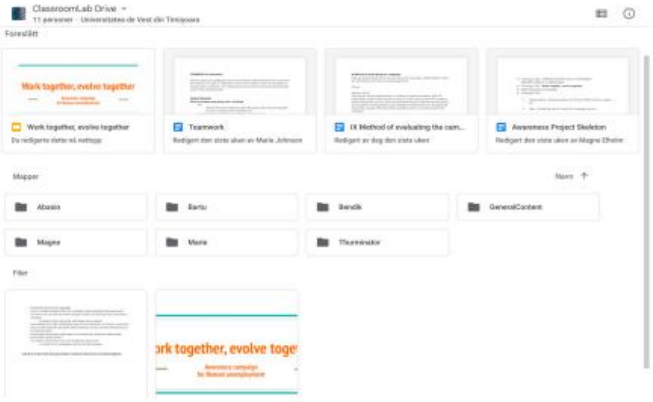


***Figure 38**. Examples of practicing and reflecting on digital skills improvement by the students attending the Classroom Laboratory UVT-NTNU Joint Course.*

DISCUSSION AND CONCLUSIONS

This study investigates how transferable competencies are formed in a digital, cross-cultural, and cross-disciplinary context of learning using a longitudinal approach. The study employs a mix of research design based on a between-subjects quasi-experimental approach, with an intervention developed through the Classroom Laboratory cross-disciplinary course conducted by UVT and NTNU. The study finds that all the students participating in the study positively appreciated the benefits arising from the design of learning activities as well as the innovative curriculum design of the joint course. The cross-cultural and cross-disciplinary learning context led students to reflect on their own learning process, with many of them feeling that direct interactions and shared learning tasks enabled them to learn from each other. The study also finds that students improved their communication and teamwork skills, particularly through the use of digital means, and developed their cultural understanding of work-life relations, which will be essential in their future work-life when working for multinational teams and clients from other countries.

The EEA Grants 2014-2021 Bringing Real Life into Virtual Classrooms project, code SEE 21-COP-0004, run by the West University of Timisoara, Romania, in collaboration with the Norwegian University of Science and Technology, Norway, was the starting point for the development of the research study on reflective learning in cross-cultural and cross-disciplinary virtual classrooms.

A longitudinal approach was designed to obtain a thorough understanding of how transferable competencies are formed in a digital, cross-cultural, and cross-disciplinary context of learning. The study team used a mixt research design that was based on a between-subjects quasi-experimental approach. The teaching-researching educational experiment (intervention) was developed with assistance from the Classroom Laboratory cross-disciplinary course, conducted jointly by UVT and NTNU.

The purpose of the study was to identify the contribution that reflective learning makes to students' development in the five transversal competencies

of reflective learning, teamwork, communication, digital competence, and cultural understanding. The study's findings also aimed to improve knowledge of the necessity of developing cross-cultural and cross-disciplinary learning contexts for future students, based not only on labor market demands and higher education curriculum planners, but also on the needs of the actual students' professional and personal development.

The transferable competencies were assessed using quantitative methods (two questionnaires) over the course of three study cycles. To evaluate students' reflections on the group learning experience and to better understand the quantitative findings, the qualitative content analysis technique was used.

To answer the research question, *which are the benefits and challenges of reflective learning in a cross-cultural, cross-disciplinary setting on the development of students` transversal competences***?** Two questionnaires and a reflective learning journal were completed by the students in three stages: at the beginning (team building stage), middle (teamwork stage) and end of the course (team performance stage. Data were collected from a convenience sample of 69 Romanian and Norwegian students enrolled at the Classroom Laboratory course.

Using specialized software, including SPSS for the quantitative analysis and MAXQDA for mixed quantitative and qualitative analysis, the collected data was processed and analyzed using mixed quantitative and qualitative methods, processing descriptive statistics, comparing groups of samples, content analysis, and hermeneutic interpretation. 69 participants' answers were examined for quantitative statistics. The 142 source documents containing the student responses to the reflective journal were then used in the content analysis to produce 127 validated source documents. The main results are presented using the transferable skills structure for presenting the results since the targeted learning outcomes for the Classroom Laboratory UVT-NTNU Joint Course and consequently, the research instruments are structured in the same way.

REFLECTIVE LEARNING

Results indicated a high level of interest in reflective learning in both beginning and end of the course, using VPBL method (similar with the results of Silva et al., 2018). Still, a slightly higher interest before the start of the cross-cultural and cross-disciplinary team-based interaction process compared to the moment of completion of the course was determined. Regardless of the university and country of origin, the students showed interest in developing their reflective learning skills, capitalizing on cross-cultural and cross-disciplinary team-based learning experience. The students' participation in the educational process, specifically in the cross-cultural and cross-disciplinary team-based learning activities, had a substantial impact on how they perceived themselves. The enthusiasm and initial over self-evaluation of the study participants, along with the fact that by the time they had finished the UVT-NTNU joint course, they had grown more conscious of their level of reflective learning competence, can be used to explain these significant differences. This awareness reflects what we previously referred to as creative tension and may serve as a solid foundation for an accurate and current awareness of one's own degree of competence.

The reflective learning skills dimension highlights the fact that after the cross-cultural and cross-disciplinary learning experiences, the students attending the UVT-NTNU joint course obtained higher scores compared to the beginning of the course. In other words, the experiences gained during the course generated a higher level of self-assessed reflective learning competence.

The level of self-assessed reflective skills proved not to be influenced by the study programs the students attend, nor by belonging to a certain gender.

The reflective journal was used to encourage students to self-assess their reflective practice during a transnational learning course. The reflective learning code relations hierarchy analysis revealed that students often associated reflective practices with team-based learning activities and the cross-disciplinary and transnational composition of their group. For instance, many students reflected on the novelty of the learning setting and the cultural diversity of their team composition. They appreciated the advantage of utilizing the knowledge, experiences, ideas, and skills of their teammates as resources for solving group tasks and achieving learning objectives.

The results of the relations analysis between the variables and the codes show that all the students participating in the study explicitly expressed their **reflections** on the innovative composition of the learning group and positively appreciated the benefits arising from the design of learning activities in mixed cross-cultural and cross-disciplinary team-based groups. All 52 students participating in the study positively appreciated the innovative curriculum design of the joint course, in which the learning process was based on the active involvement of students in groups of students with a high degree of interdisciplinary and transculturally interactions.

The cross-cultural and cross-disciplinary learning context led students to reflect on their own way of learning in this course. They appreciated the opportunity to observe the level of knowledge, skills, attitudes and behavior of their team members and they reflected on the way students from other universities, with different cultural and educational backgrounds relate to learning and use their reflective learning skills. Many of the students felt that direct interactions and shared learning tasks enabled them to learn from each other and learn more than in a mono-cultural and mono-disciplinary learning context.

Students practiced reflective learning throughout the entire course, including self-assessment practices, which motivated them to actively engage in the learning process and achieve better learning outcomes.

The present study's results indicate a significant level of interest in reflective learning among students, both before and after engaging in cross-cultural and cross-disciplinary team-based learning activities. This finding aligns with Achuthan et al.'s (2017) study, which similarly reported high levels of interest in reflective learning among students. Notably, while the interest was marginally higher before the course's commencement, the experiences gained during the course generated a greater level of self-assessed reflective learning competence, as observed by Hidayatul Khusna (2021). This suggests that such activities can have a profound impact on students' self-perception and abilities, consistent with Agustin's (2019) findings.

An interesting observation from this study was that students' self-assessed reflective skills did not vary based on their study programs or gender, implying that this type of learning can benefit all students, irrespective of their background.

Furthermore, reflective journals were found to be a valuable tool for promoting students' reflection on their learning experiences, similar to the findings of Straková and Cimermanová (2018). The analysis of these journals revealed that students associated reflective practices with team-based learning activities and appreciated the advantages of using their teammates' knowledge, experiences, ideas, and skills to achieve learning objectives.

In conclusion, this study's findings underscore the significance of incorporating cross-cultural and cross-disciplinary team-based learning activities and reflective practices in educational programs. Such an approach can motivate students to actively engage in the learning process, resulting in better learning outcomes and greater competence as learners.

COMMUNICATION SKILLS

In this study, the participants placed high value on communication skills, which remained consistent throughout the entire learning process. Participants from the University of Timişoara (UVT) rated communication skills as more important than those from the Norwegian University of Science and Technology (NTNU). The study found that participants became more aware of their own communication skills and made a more realistic self-assessment as they progressed through the course. Team-based learning in cross-cultural and cross-disciplinary environments was found to strongly influence participants' self-assessment of communication skills, particularly for those from NTNU. There were no significant differences in the subjective evaluation of communication skills between STEM and non-STEM participants, nor between male and female participants. The evaluation at the end of the course activities resulted in slightly higher scores compared to the initial assessment of communication skills. Participants associated communication skills with reflective practice, expressing ideas, teamwork, and feeling challenged, enthusiastic, interested, and content. Communication practice involves involving all team members, efficiently navigating brainstorming, being aware of cultural differences, and overcoming communication barriers.

The present study reveals that the incorporation of reflective learning practices can lead to a beneficial impact on the development of communication

competencies among students. This finding is consistent with prior research in this field (Deveci & Wyatt, 2021; Karnieli-Miller et al., 2020). Additionally, team-based learning has been demonstrated to have a substantial impact on the improvement of communication skills among university students in various academic disciplines (Siedlecki, 2020; Hazel et al., 2013; Wu, 2022).

Participation in cross-cultural and cross-disciplinary learning environments provided a valuable opportunity for participants to reflect on their communication skills and engage in genuine communication interactions with individuals from diverse cultures and fields of study. Such opportunities were found to be effective in developing 21st-century communication skills (consistent with the outcomes of Gyasi et al.'s systematic review, 2021). Participating in cross-cultural groups allowed students to gain a deeper awareness of their communication skills and perform a more realistic self-assessment.

In terms of practicing **communication skills**, the cross-cultural and cross-disciplinary learning context of the UVT-NTNU joint course brought many **benefits** to the students, especially in the first part of the course when student teams were formed and consolidated (T1 – Team Building stage). In particular, students following a non-STEM study program in social sciences, humanities and arts, and students who did not use VR technology in their team-based activities, appreciated that they improved their communication skills with the help of digital means. A possible explanation is that in the professions associated with social sciences and humanities, direct interpersonal communication of the face-to-face type is valued, which allows to a greater extent to create an open communication climate with the help of non-verbal messages, such as gestures, mimicry, posture. While students pursuing STEM degree programs are more frequently exposed to communication technology and more familiar with streamlining digital communication. UVT students believe that they have improved their communication skills due to the learning context of the joint course which facilitated their active involvement in communication by nurturing to express their opinions and ideas and feel comfortable in a communication across distance.

The development of communication skills among students can be explained by the reflective nature of the interactions that occurred during cross-cultural and cross-disciplinary activities. The present study's findings emphasize the potential of team-based learning in cross-cultural and cross-

disciplinary settings to enhance communication skills among university students. These findings can assist educators in designing effective communication training programs for their students, particularly in the context of globalization and the increasing importance of cross-cultural and cross-disciplinary interactions. Future research may further investigate the effects of team-based learning on communication skills and explore the long-term impacts of such training programs.

TEAMWORK SKILLS

In today's society, professional and personal activities are constantly evolving, and the ability to work in a team has become an essential skill for individuals (Mitchell et al., 2010; Kingma, 2017), moreover in a virtual setting (Baptista, 2022). This skill requires attention not only from the perspective of individual contributions and task execution, but also from the perspective of shaping social actors' behavior. The readiness to delegate responsibilities, focus on specific objectives, integrate feedback, and model behavior according to new rules are some of the benchmarks that individuals must consider in developing teamwork skills.

This study also examined the importance given to teamwork skills and individuals' self-perception regarding their teamwork skills. The analysis revealed that the participants placed significant importance on their ability to work in a team, and the interest remained high throughout the course, irrespective of the university of origin. These findings highlight the relevance of efforts to enhance teamwork competencies among individuals.

The analysis of the reflections of students who reported on how they practice their teamwork skills showed that they often reflect on how they learn in a transnational team-based setting and how they can be actively involved in communication and efficient teamwork interactions with other students and teachers. They also emphasized the need to cultivate teamwork skills, both at the outset and upon completion of the training activity. Furthermore, they reflected on the difficulties they confronted during the team-building phase and described various solutions they adopted to accelerate the team-building

process and increase the effective workflow in their team-based learning activities.

Cross-cultural learning settings have a positive impact on developing teamwork skills (similar with the results of Krab-Hüsken et al., 2022).

At the beginning of the learning process, most students showed confidence in their high level of competence in teamwork skills. However, during the second and final phases, they tended to self-assess their teamwork skills with more moderation, and their reflective journals revealed detailed explanations for this changed self-perceived level of teamwork skills. Some students realized that having social skills and being enthusiastically involved in team-based activities is not enough to build trustful relationships between teammates and make a team work properly to achieve its goals. Others recognized that their good competencies in teamwork skills were achieved in controlled teamwork settings, with important premises that they do not have in this particular course, and which will not be granted in a real-working context.

The results showed that the participants obtained lower scores in the second moment of self-assessment compared to the initial self-assessment, indicating the presence of elements of creative tension. The study found that non-STEM students were more aware of the need to develop teamwork skills compared to STEM students, and male respondents showed a slightly stronger need for improvement than female respondents. The analysis of responses highlighted that the experience of the course activities, interaction with team members, and intercultural and interdisciplinary nature of the course contributed to an increase in the level of self-assessment of teamwork skills at the end of the training activity compared to the initial assessment. The results indicate that any differences in self-perception are situational and do not reflect an influence that may have occurred during the course activities on the skills to work in a team.

Teamwork skills were the subject of the reflections of all students who answered the open-ended question called "Reflective journal". The Romanian students mainly reflected on improving their teamwork skills by using the team-based activities to learn from the experience, ideas and knowledge of NTNU students. NTNU students reflected on the intensity of their involvement and how they contributed to the achievement of team goals and tasks, appreciated that this learning experience helped them to be confident in their

high level of competence in teamwork skills, and that they will use the results of this experience in their future work-life. Students following study programs in social sciences, humanities and arts (non-STEM) reflected on their progress in teamwork skills and appreciated that this learning context contributed to increased motivation and active involvement in learning. Students following an educational path in technology, engineering, computer and mathematics study programs (STEM) mainly reflected on the process of orienting team activities towards the goal, solving tasks and the team project final assessment. Students who used VR technology in the team-based activities reflected on the increased effectiveness of team building activities when they involve the use of VR technology, stating that through the use of VR devices and collaborative applications and platforms dedicated to virtual reality technology, student teammates achieved very quickly an high level of mutual knowledge, openly communicate and laid the foundations for collaboration oriented towards learning tasks.

In conclusion, teamwork skills are essential in contemporary society, and individuals must prioritize developing these competencies. The study findings highlight the relevance of teamwork skills and the need to enhance these competencies among individuals, both from an individual and societal perspective.

CULTURAL UNDERSTANDING SKILLS

The present study aimed to examine the importance of cultural understanding skills and individuals' self-perception regarding their skills in a cross-cultural learning setting. The results showed that participants placed significant importance on their ability to work in a diverse team, and the interest remained high throughout the course, irrespective of the culture of origin. This finding highlights the relevance of efforts to enhance cultural understanding competencies among individuals.

The study also found that cross-cultural learning settings have a positive impact on developing cultural understanding skills. It is the best learning environment for developing tolerance, diversity acceptance, cultural

awareness, and empathy, which are essential skills for effective communication and teamwork in a multicultural environment.

Half of the students expressed their thoughts and self-reflections in their reflective journal referring directly to the cultural understanding of multinational working relations skills. The analysis of the reflective journals revealed that students reflected on how to use the cross-cultural composition of their team, how they feel comfortable in communication, how the cross-cultural composition of their study group motivates and improves their teamwork skills and their cultural understanding of work relations.

Collaboration in multicultural teams presents challenges that can impede effective teamwork. These challenges include language barriers, cultural misunderstandings, and conflicts arising from differences in mindset (Nurmi, 2009). The findings of this study support these difficulties encountered in multicultural teams, where individuals with diverse cultural backgrounds may interpret and respond to situations differently, leading to misunderstandings and conflicts. The language barrier is also a significant challenge that can impede effective communication and limit the participation of team members.

The study found that participants placed a high level of importance on cultural understanding skills at both the initial and final evaluations, with no significant difference between the two. However, significant differences were observed between the initial and final evaluations for participants from UVT and those in non-STEM programs, indicating the presence of creative tension. Female participants also showed significant differences between the two evaluations, suggesting a positive impact on their ability to work with people from other cultural backgrounds. The results indicate that the course experiences had a strong influence on participants' self-definition of intercultural understanding skills, with the second evaluation recording more modest values than the initial evaluation. The Wilcoxon test revealed significant differences, indicating that participants' level of demands during the second evaluation of intercultural understanding was higher, likely due to the experiences gained during the course.

Significant differences were observed between the initial and final evaluations for participants from UVT and those in non-STEM programs, as well as for female participants, indicating a positive impact on their ability to work with people from other cultural backgrounds. The second evaluation recorded lower values than the initial evaluation, likely due to the experiences

gained during the course. The results indicate that the course experiences had a strong influence on participants' self-definition of intercultural understanding skills. The Wilcoxon test revealed significant differences, indicating that participants' level of demands during the second evaluation of intercultural understanding was higher.

Throughout the learning process, the students appreciated that the cross-cultural composition of the teams of Romanian and Norwegian students brought them real benefits for improving the skills of **cultural understanding of work-life relations**. The students explained in their reflective journals the urgent need to have skills of cultural understanding of work relations in order to perform in specialized professions, considering that in their future work-life they will be part of multinational teams and will work for clients and beneficiaries from other countries, where the products or services they will provide will have to be integrated and function in a different socio-cultural context. Students attending STEM specializations most frequently reflected on the cross-cultural composition of the teams, as a factor favoring the development of the skills of cultural understanding of working relations. Also, UVT and NTNU students equally believe that the two important factors that helped students develop their cultural understanding skills are the orientation of the course theme and project-topics towards the identification of practical solutions for current social problems extracted from real-life contexts and the promotion of community-need oriented attitudes.

Thus, it is essential for team members to develop cultural competence and communication skills that facilitate effective collaboration in multicultural teams, moreover in virtual cross-cultural teams. Strategies such as active listening, respect for diverse perspectives, and the use of common language can help address these challenges and promote successful teamwork in multicultural settings.

DIGITAL SKILLS

The findings suggest that the students who participated in the UVT-NTNU joint course had a high level of competence in digital skills. This is not surprising, given the larger context of the students' prior experiences with open

educational resources, digital tools, and platforms for learning. However, the small number of students who explicitly referred to digital skills in their reflective journals entailed more insight in future studies.

The results showed that digital competencies were perceived to be highly important by participants at both the beginning and end of the course, with a slight increase in perceived importance observed at the end. The analysis of the differentiated importance accorded by the students of the two universities to digital competencies revealed that during the initial evaluation, students from UVT attributed a higher level of importance to digital competencies in comparison to their counterparts from NTNU. The study also found that self-assessment of digital skills improved over time, with significant differences between the two evaluation moments observed at the group level. Non-STEM students showed a significant improvement in their self-assessment of digital skills, while gender did not influence the evaluation. Finally, the Wilcoxon test indicated that participation in the course did not significantly alter the way participants evaluated their digital skills, possibly due to the minimum level of digital proficiency required to participate in the course.

The digital skills code relations hierarchy analysis revealed that students were most likely to reflect on how to use their digital skills effectively in the context of virtual classroom settings and team-based activities. Many students also recognized the importance of digital skills as a precondition for participating in the course.

Furthermore, students reported that they had gained confidence in using digital platforms and tools for communication and collaboration during the COVID-19 pandemic. This was seen as a significant advantage for the current course setting, which relied heavily on digital means for teamwork and interaction.

Student reflections less frequently targeted directly are the **digital skills**. Students studying STEM fields of study and students who had not used VR technology reflected analytically on how the UVT-NTNU Joint Course's learning context led them to find effective ways to use their digital skills to communicate and collaborate in distance and to contribute to the progress of the team project. Indirectly, many of the students' reflections were about practicing and improving their digital skills. Thus, the non-STEM students appreciated that during the learning process they significantly improved their communication skills through the effective use of digital means. Furthermore,

non-STEM students who have used VR technology in teamwork activities describe different ways in which the use of VR technology has helped them to improve their communication and teamwork skills. Especially in the first stage of team development (T1 – Team Building) they say that digital communication allowed them to voice their opinion and raise their level of competence in communication skills. Although in the early stage of team formation and consolidation, NTNU students reflected on the difficulty of organizing synchronous work meetings across distance, their reflections show the awareness of the need to be actively involved in communication, very frequently encouraging the Romanian students to feel free to express ideas and communicate actively.

Finally, the students presented their use of digital platforms and tools in their final project presentations, highlighting the importance of digital skills in their work. Overall, the discussion suggests that digital skills played a critical role in the success of the UVT-NTNU joint course, enabling effective communication, collaboration, and teamwork across distances.

In conclusion, the longitudinal study provided insights into how transferable competencies can be formed in a cross-disciplinary and cross-cultural context of learning, particularly in the digital age. The mixed research design with a between-subjects quasi-experimental approach allowed for the exploration of the relationship between the learning context and the development of transferable competencies, such as communication, teamwork, cultural understanding, and digital skills. The study involved 69 students from the University of Vest Timisoara and the Norwegian University of Science and Technology.

The findings of the study indicated that the innovative composition of the learning group and the design of learning activities in mixed cross-cultural and cross-disciplinary team-based groups were positively appreciated by all the students participating in the study. The students appreciated the opportunity to observe and learn from their team members with different cultural and educational backgrounds, which enhanced their understanding of learning and collaboration. The cross-cultural and cross-disciplinary learning context provided an environment for students to reflect on their own learning style and to develop their transferable competencies.

In terms of communication skills, the study found that the cross-cultural and cross-disciplinary learning context provided benefits for students,

particularly in the first stage of the course when teams were formed and consolidated. The study revealed that non-STEM students improved their communication skills through the use of digital means, while STEM students were more familiar with digital communication technology. Teamwork skills were also developed, with students reflecting on the progress they made and how the experience would help them in their future work-life. The study showed that the cross-cultural composition of the teams brought real benefits for improving the skills of cultural understanding of work-life relations.

The study also found that the digital skills of students were indirectly developed through the learning process, particularly in terms of communication and collaboration in distance. The use of VR technology in team-based activities was identified as an effective way to improve communication and teamwork skills, especially in the early stages of team development.

RECOMMENDATIONS DERIVED FROM THE RESEARCH RESULTS

1. Use a research-based approach to validate creative, new teaching methods for a modern curricular design. HEIs should find solutions to make learning relevant for the 21st century, by developing transferable competencies and real-life skills.
2. Incorporate a teaching-researching educational experiment (intervention) that could help develop transferable competencies in students. Such interventions could be developed with assistance from cross-disciplinary courses, conducted jointly by multiple universities.
3. Encourage the formation of mixed cross-cultural and cross-disciplinary team-based groups in the learning process. This approach could involve actively involving students in groups of students with a high degree of interdisciplinary and transculturally interactions.
4. Facilitate direct interactions and shared learning tasks that enable students to learn from each other in a cross-cultural and cross-disciplinary learning context. This could involve promoting team-building activities that involve the use of virtual reality devices and collaborative applications and platforms dedicated to virtual reality technology.

5. Promote communication skills development in students, particularly in a cross-cultural and cross-disciplinary learning context. This could involve providing digital means that facilitate effective communication among students, such as video conferencing, instant messaging, and social media.

6. Encourage teamwork skills development in students in a cross-cultural and cross-disciplinary learning context. This could involve providing opportunities for students to learn from the experience, ideas, and knowledge of students from other universities and cultural backgrounds.

7. Promote the development of cultural understanding skills in students in a cross-cultural and cross-disciplinary learning context. This could involve orienting the course theme and project-topics towards the identification of practical solutions for current social problems extracted from real-life contexts and promoting community-need oriented attitudes. Additionally, it could involve fostering an open communication climate that facilitates cross-cultural understanding and appreciation of cultural differences.

Overall, the findings of the study suggest that cross-disciplinary and cross-cultural learning contexts can provide a rich environment for the development of transferable competencies in the digital age. The study highlights the importance of providing opportunities for students to work in teams with diverse cultural and educational backgrounds and the importance of digital means for communication and collaboration in distance.

Future research could explore the transferability of these competencies to other contexts, such as work-life or further education. Additionally, further investigation could be undertaken to examine the effectiveness of specific digital technologies in enhancing transferable competencies. The study provides a basis for further research into cross-disciplinary and cross-cultural learning contexts in the digital age and how they can be utilized to develop transferable competencies.

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