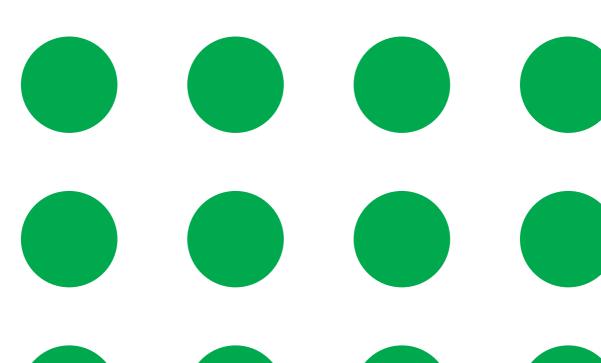EDÍCIA MONOGRAFIÍ

ZUZANA TURLÍKOVÁ, SOŇA OTIEPKOVÁ

Codifying Innovation in Learning and Teaching

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Zuzana Turlíková
Soňa Otiepková

/ *editors*

CT.uni
CREATIVE THINKING

2025
CODIFYING INNOVATION IN LEARNING AND TEACHING

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Zuzana Turlíková
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/

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Foreword

In education, teachers play the central role in imparting young people's skills, competencies, knowledge and international perspectives. Teachers must have access to excellent training and attractive perspectives for their professional development, personal growth and career prospects. The complexity of societal and scientific problems has required a change in universities' approach to the creation and transmission of knowledge. The business sector and policy-makers have noticed the need for interdisciplinary and transdisciplinary research and have invested in EU programmes like Horizon 2020.

Eight partners from eight European universities located in seven European countries have embarked on a unique educational project within the KA2 (*Key Action 2: Cooperation among organisations and institutions*) Erasmus+ scheme*, CT.uni: Creative Thinking—Taking an Innovative and STEAM Approach for a Transdisciplinary University.* The publication you are reading is an integral component of the CT.uni project.

The CT.uni project is a testament to the power of international collaboration. It brings together researchers with different backgrounds, each contributing unique cultural and educational perspectives. This diversity enriches the project's outcomes and ensures its global relevance.

Collaborating partners in the CT.uni project include researchers from following universities: Dresden University of Technology, Germany (TUD); Bifröst University Iceland (Bifröst); Sapienza University of Rome, Italy (Sapienza); University of Amsterdam, the Netherlands (UvA); Maria Curie-Skłodowska University in Lublin, Poland (UMCS); Guarda Polytechnic University, Portugal (IPG); Slovak University of Technology in Bratislava (STU); and University of Economics in Bratislava, Slovakia (EUBA).

The CT.uni project is not a standalone initiative but a continuation of the successful Erasmus+ project *DT.uni: Design Thinking Approach for an Interdisciplinary University* (2017–2020). With a similar partner consortium, the CT.uni project builds on the proven track record, ensuring its potential for success. The project's main aim was to develop innovation in higher education institutions.

Inter- and transdisciplinary approaches prove invaluable not only for scientists but also for all those involved in the learning process, from teachers and researchers to students as well as managers, administration and external institutions, enhancing the community. Transversal competencies, creativity, and flexibility grow while these approaches afford more profound knowledge and a richer vocabulary to support a better understanding of other disciplines. While several approaches to multi-, inter- and transdisciplinary learning currently exist, the CT.uni project is an opportunity to develop a collaborative meta-study as a comprehensive overview of what has been developed in higher education to identify the specific effectiveness of creativity and innovation and a broader STEAM approach.

The overall objective of the project is to provide the basis for enhancing transdisciplinarity at higher educational institutions by using an innovative, creative, and STEAM approach. It also aims to support students, researchers, academics, and management staff in developing their abilities to think divergently, creatively, and critically while strengthening cooperation with external institutions as essential partners for a modern university.

The project's international dimension is essential for achieving the objectives, as each project partner was carefully chosen to bring added value to the consortium. The complementary potential rooted in different cultures and educational backgrounds results in robust outputs supported by high-quality research and analysis.

The present publication represents one of the *Intellectual Outputs* designated within the CT.uni Erasmus+ project, also known as a project result. The four Intellectual Outputs to be created for the CT.uni project are:

1. *Creativity, Innovation & STEAM in the HEI Classroom and in the Cloud;*
2. *Codifying Innovation in Learning and Teaching;*
3. *Recommendations for Greater Innovation in Learning and Teaching;*
4. *Evaluation Study of the Implementation Process.*

Our Intellectual Outputs are indirectly linked, which has meant that specific research has been carried out for each separate project result. While the first was dedicated to exploratory desk research of literature sources and extensive analysis of case studies in higher education dedicated to creative thinking and innovation, the second examines the influence and level of innovation when external stakeholders participate in the learning and teaching process. The third gathers practical tips and ideas on using different tools, strategies, and approaches to make learning and teaching through creative thinking more interesting and innovative. Finally, the fourth is related to the overall outputs and specifically evaluates the implementation process of project result 3.

Taken as a whole, the intellectual outputs each offer an essential and logical piece of the overall mosaic that is the CT.uni project, taking an innovative and STEAM approach for a transdisciplinary university.

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Context

The publication *Codifying Innovation in Learning and Teaching* focuses on profiling the challenges associated with creative thinking, interdisciplinarity, collaboration, and STEAM teaching principles. It includes methods and tools for gathering and assessing innovation challenges that arise when working with external stakeholders. There are many factors that foster innovation in the learning process. In our research, we examined innovation from the perspective of an external stakeholder present in the teaching process. What kind of influence on creative thinking and innovation the university–industry cooperation has? By "codifying innovation," we mean identifying the benefits and challenges that arise within such cooperation and suggesting a set of recommendations that help to verify and check the readiness of higher educational institutions to include external stakeholders in the learning and teaching process.

The publication presents a collection of interpretations of four questionnaires aimed at four main target groups who participate in the educational process—HEI (higher education institutions) Partners, HEI Students, HEI Teachers and HEI Managers.

The data is based on research by a European consortium of universities and reflects data collection from students, teachers, university management and external stakeholders who have been involved in the collaborations between university and external stakeholders. The publication aims to identify how challenges of such collaborations can be identified, codified and harnessed by academics to support student leadership.

The research involved quantitative data collection through questionnaires at eight universities, which identified the advantages, disadvantages, challenges and benefits of university-practice cooperation. The emergence of innovation and the development of creative thinking during such cooperation has been investigated. The insights were then subjected to qualitative, in-depth analysis by expert groups composed of educators, curriculum sponsors, and education experts to compile criteria for successful collaboration. Finally, a series of recommended criteria, to be considered as a prerequisite for successful collaboration between higher education institutions and partners from practice has been identified.

The publication is addressed to higher education institutions—university management, and educators, but also to external partners who have a sincere interest in building effective, innovative and socially beneficial partnerships.

The publication takes a unique approach, focusing on challenge profiling and the inclusion of methods and tools to collect and assess innovation issues. It aims to identify how challenges from different stakeholders (e.g. local authorities, city regions, government, business, industry and policy makers) are identified, codified and used by academics to support the student experience, whether through teaching strategies or in curriculum design. This approach leads to an increased understanding of how a meaningful pipeline of knowledge is created, which can be tackled through innovation-focused methods within learning and teaching.

The output proposes a framework for selecting innovation topics for classroom and online activities. This output will comprise exploring mechanisms to build external partnerships and understand knowledge flows, including identifying profiling tools as appropriate; an outline of the needs of external organizations in working with universities on innovation challenges and the needs of universities in running innovation courses, including how students can benefit from tackling external challenges. A key objective of this research is to develop a structured method for defining and categorizing innovation challenges in a way

that universities can effectively integrate into their curricula, resulting in a and a method for codifying the challenges of external organizations.

The research was conducted in three stages:

1. *THE FRAMEWORK*
    Understanding the key platforms and terms used for knowledge collection and building partnerships between universities and external organizations
    We will investigate knowledge flows and exchanges with stakeholders and other organizations and develop an understanding of what information external organizations are prepared to share. This will enable the identification of the routes through which challenges come into a university, analyzing what was successful in previous engagements. This part of the research is summarized in the theoretical framework of this publication, where the most relevant key expresions are explained and described in accordance with publication's purpose.

2. *THE SURVEYS*
    Examination of the needs of external organizations when working on innovation challenges with universities
    What are their expectations, and what do external organizations stand to gain? How do they perceive the academic knowledge base? The university system can be seen as siloed. Can methods be developed that allow students to seek insights on external issues by combining the analytical strengths of STEAM with the creative thinking techniques of the arts? What types of innovation challenges align with different fields of study? This stage will also examine how academics developing course criteria and content can valuate whether a stakeholder challenge is within the scope of the course. It is the most important and fundamental part of this research and is included in chapters 1-4 in this publication. Questionnaires were used to capture the needs and expectations of the external stakeholders, precisely aimed at finding out the information needed to set up a successful cooperation.

3. *THE INTERPRETATION*

   Elaboration of a set of recommendations for successful cooperation that leads to innovative and creative thinking

   How can the challenges be collected, themed, and framed meaningfully? Through developing processes to determine what challenges stakeholders face, universities can find better ways to work with partners to create solutions. This will lead to universities understanding stakeholders' challenges from their points of view, not just those of the universities. As a result, a more user-centred process will be advocated. Overall output will provide practical advice on analyzing external challenges and developing techniques for academics to assess their suitability for courses and other forms of student learning, including placements and real-life projects. Stage 3 is reflected in the Conclusion chapter of this publication, where three key findings of each study are summarized and reflected in overview tables.

This study should enable universities to engage more effectively with external organizations by viewing challenges from the stakeholders' perspectives rather than solely through an academic lens. By prioritizing a user-centered process, universities can develop more relevant and impactful collaborations. The results aim to offer practical guidance on analyzing external challenges while also providing academics with structured methods to determine the best fit for integration into courses, student projects, internships, and other experiential learning opportunities.

Method

The key hypothesis that guided the research was:

- *Active collaboration between universities and external partners positively influences the development of students' creative thinking and drives innovation.*

During the process other questions arose:

- *What are the benefits and challenges of cooperation between university and practice?*
- *What are the challenges resulting from the questionnaires' key insights?*
- *What are the criteria for successful cooperation? Can we measure it? If so, how?*

Eight universities worked in four pairs to develop four questionnaires targeting key stakeholders in the educational process—higher education institutions (HEI) Partners, HEI Students, HEI Teachers and HEI Managers:

- HEI Partners who want to establish multi-aspect relationships to tackle global challenges and develop innovative solutions;
- HEI Managers who look to evaluate the impact of innovative and trans disciplinary approaches and hope to introduce cross-faculty strategies;
- HEI Teachers who aspire to develop innovative curricula;
- HEI Students who would like to foster their creative thinking, intellectual curiosity and problem-solving skills applicable in multiple disciplines.

The main objective of the surveys was to comprehend the expectations and perceived obstacles when cooperating with the university's external environment. Most questions examined existing cooperation systems and approaches. The data collection also aimed at discovering the learning methods (STEAM), motivations, time availability, financing, and innovation potential—the core criteria and parameters of collaboration.

Each questionnaire was distributed by university representatives and CT.uni researchers across all eight universities, which enabled the collection of valuable cross-national data.

To ensure meaningful and valid responses, two questionnaires were conducted as qualitative ones, focusing on a smaller number of respondents, with whom the survey was filled in the form of a semi-conducted interview (HEI Partners' and HEI Managers' questionnaires). The respondents from the "Partners" category were thoughtfully selected based on previous experience and extended partnerships, making their contributions to the study meaningful. The interviews also aimed to strengthen collaboration and clarify future expectations. The "Managers" category respondents were primarily members of the board of faculties or universities and faculties' vice-deans for Research or Development.

Two additional surveys were conducted as quantitative questionnaires, gathering anonymous responses to maximize the number of participants (HEI Students and HEI Teachers Surveys).

All questionnaires remained open from 30 May to 30 November 2023.

Following collaboration with CT.uni project partners and a thorough evaluation of all four questionnaires, the study identified 16 relevant interviews in the HEI Partners Survey, 49 interviews in the HEI Managers Survey, 272 responses to the HEI Teachers Survey and 536 responses to the HEI Students Survey.

This publication consists of four core chapters, each based on a survey evaluating the level of creative thinking and collaboration between students, lecturers, university management, and representatives from various organizations—external stakeholders—such as companies, international corporations, small or medium enterprises, non-governmental organizations, and local authorities within the context of experience with higher education.

Each of the core chapters in this publication has a similar structure, enabling the reader to access the information quickly and find more detailed information about the report. Each report contains its specific introduction with a particular explanation of the background idea and goal behind the composition of each questionnaire.

This is followed by the technical data section, which also includes the duration of the questionnaires, a detailed evaluation of the selected and most relevant answers, an interpretation of the answers, and a conclusion.

Together, these four questionnaires and their final reports offer a comprehensive analysis of the challenges, barriers, and benefits of cooperation between higher educational institutions and external stakeholders viewed from the perspective of HEI Partners, Managers, Teachers, and Students.

Theoretical Framework

Several key expressions guide not only this publication, *Codifying Innovation in Learning and Teaching*, but appear throughout the whole CT.uni project. The following paragraphs will explain and further examine the expressions in the context of the critical hypothesis: Creative thinking is fostered, and innovation is more likely to occur when higher education institutions cooperate with external stakeholders.

1. **STEAM**

The following chapters often mention the concept of STEAM, which is one of the main pillars of the CT.uni project. The following chapter will explain and further examine the expressions in the context of the critical hypothesis.

STEAM (Science, Technology, Engineering, Arts, and Mathematics) education represents an evolving educational paradigm characterized by a rapid expansion in research literature. However, this field is also marked by notable inconsistencies and a lack of clarity in both its terminology and pedagogical approaches (Aguilera and Ortiz-Revilla, 2021; Colucci-Gray et al., 2017; Matsuura and Nakamura, 2021). A persistent tension within this evolving domain is portraying the arts as supplementary, rather than equal, to the various STEM (Science, Technology, Engineering, and Mathematics) disciplines.

While STEAM is widely recognized for its potential to enhance creativity and problem-solving skills, there remains a significant gap in evidence or assessments measuring its actual impact on students' cognitive development (Perignat and Katz-Buonincontro, 2019). Despite its promise, more rigorous studies and clearer definitions of STEAM education are needed to fully understand its effectiveness.

STEAM has been instrumental in education, particularly in integrating the arts with STEM disciplines. However, while its potential is widely recognized, there remains a significant gap in rigorous evidence or assessments measuring its direct impact on students' creativity and cognitive development. STEAM fosters innovative and creative approaches in the arts and STEM education, particularly in new media, the maker movement, and digital technology (e.g., Colucci-Gray et al., 2017). It not only connects disciplines (interdisciplinary) but also transcends traditional academic boundaries to create new ways of thinking and solving problems (transdisciplinary).

However, the pedagogy and label of STEAM have sometimes been applied in ways that do not fully recognize the epistemological significance or the educational potential inherent in the deep integration of STEM and the arts (Bartlett and Bos, 2018). Perspectives on the "A" in STEAM vary, with some interpreting it as solely visual arts, such as drawing or sculpture, while others expand it to encompass performing arts, crafts, and other expressive forms (National Art Education Association, 2016). Additionally, 'arts' is occasionally synonymous with project-based, technology-based, or design-based activities (Perignat and Katz-Buonincontro, 2019).

The purpose of STEAM education is also a subject of debate. Predominant research approaches view the arts either as tools to enhance learning in STEM disciplines (Ge et al., 2015) or as means to develop general skills such as creativity, problem-solving abilities, knowledge transfer, and novel ways of understanding (Perignat and Katz-Buonincontro, 2019).

While STEM focuses on developing students' research activities, experimentation, and abilities to think analytically, creatively, and critically, its incorporation presents numerous challenges, particularly within the school setting. This is especially true in the engineering component, content integration, and in the face of limited planning time and teaching resources (Dong et al., 2020; Margot and Kettler, 2019).

2. Interdisciplinarity

As the project brings together academics from different countries, fields, and scientific disciplines, the term "interdisciplinarity" is central to the CT.uni project, reflecting its nature and core. "Interdisciplinarity" refers to the collaboration between two or more academic fields. Interdisciplinarity is rooted in the existence of distinct academic disciplines and branches of knowledge. Interdisciplinarity, therefore, has its conceptual background in the 20th century and the institutionalization and segmentation of scientific research in the 19th century (Raento, 2020).

In recent years, the concept of interdisciplinarity has become popular among scholars. Books on interdisciplinary approaches range from those advocating for it (Farrell, Luzzati & van den Hove, 2013; in Miller, 2020) to those emphasizing the strengths of traditional disciplines (Jacobs, 2014; in Miller, 2020).

The motivation for interdisciplinary collaboration often emerges from a specific problem needing a solution or a significant new societal development. Globally relevant examples include climate change, digitalization, refugee and food crises, obesity, and potential pandemics. Collaborating scholars approach their topic of study using the theoretical, methodological, and conceptual toolkits characteristic of their disciplines but adjust them to serve a common goal. Their work ideally produces a comprehensive understanding of a particular phenomenon, a region, or people. Rather than merging entire fields, interdisciplinarity integrates selected specialties from different disciplines in a complementary way. Success highlights instrumental problem-solving, good communication, and a constructively critical exchange of ideas. Interdisciplinarity thus engages elements from both basic and applied research because the goal is to understand how things are and solve particular problems for a shared benefit (Raento, 2020).

"Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice" (National Academy of Sciences, 2005, p. 39; in Miller, 2020).

Interdisciplinarity involves synthesizing findings from multiple disciplines, using different conceptual frameworks to achieve a comprehensive integration (Elio and Termini, 2017; Macleod and Nagatsu, 2018).

One recurring idea cuts across all these theories. Interdisciplinarity solves problems and answers questions that cannot be satisfactorily addressed using single methods or approaches. Whether the context is a short-range instrumentality or a long-range reconceptualization of epistemology, *"the concept represents a significant attempt to define and establish common ground"* (Klein, 1990, p. 196; in Miller, 2020).

3. External Stakeholders

One of the core goals of this publication is to challenge profiling and include methods and tools to collect and assess innovation issues. Cooperation with external partners, organizations, and institutions inevitably brings both benefits and barriers for all involved. It aims to determine how challenges from different stakeholders can be identified, codified and leveraged by academics to support the student experience. This will enhance understanding of how a meaningful knowledge pipeline of knowledge is created and how it can be addressed using innovation-focused methods in learning and teaching.

According to the CT.uni project proposal, external stakeholders are local authorities, city regions, government, business, industry, and policy influencers. External stakeholders are outside an organization (Mazur and Pisarski, 2015; in Yong et al., 2022). For entrepreneurial start-ups and their growth, these stakeholders must be viewed as sources of opportunity (Kuratko et al., 2007; in Yong et al., 2022). Research has shown that information from third parties can help entrepreneurs discover opportunities (Kuratko

et al., 2007; in Yong et al., 2022) to improve business performance (García-Sánchez et al., 2018; in Yong et al., 2022).

"A vision of education that advocates for teaching and learning that is more than a means to an end but rather a practice that enables personal and societal growth" (Abegglen et al., 2021, p. 3). The link between higher education and practice is crucial for the future success of graduates in the labour market and it can also be one of the markers that determine the quality of HEIs.

"Collaboration is or creates a third space, an in-between space, facilitating deep and meaningful practice and valuable reflection to give focus and generate new meanings and potential solutions. Webster describes this as a space where boundaries are fuzzy and malleable, and hence, a space that can expand and morph to accommodate the needs of those involved and the broader environment. It is a space where the negative striations of normal academic power relations can be swept away as together, participants can (re) define the space and inhabit it more powerfully" (Abegglen et al., 2021, p. 3).

As we strive for education for social justice, there is a need to develop programs and courses that better welcome and "hold", sustain and support both those who are learning and those who are teaching. A humane academia requires methods and methodologies that offer multiple, non-hierarchical entry and exit points (Deleuze and Guattari, 1987) that embrace uncertainty (Cormier, 2012), creativity (Sinfield, Burns, and Abegglen, 2019) and cooperative third spaces (Abegglen et al., 2021). Such liberatory spaces need to be supported by critical (Freire, 2007) and democratic (Dewey, 1916) pedagogic practices that create a more welcoming university that acknowledges the super-complexity of people's lives (Abegglen et al., 2020). As argued by Bhabha (2004), it is in a collective *"third space"* (Burns et al., 2019; Gutierrez, 2008) whereby *"being with"* (Nancy, 2000) individuals start to *"become together"* (Abegglen et al., 2021).

4.   Creative Thinking

The concept of creative thinking is also the fundamental backbone of the CT.uni project. The significance of creativity for thriving in contemporary society is widely acknowledged. Nonetheless, nurturing creative thinking skills within formal education frameworks still demands greater focus.

According to *The Future of Jobs Report 2023*, published annually by The World Economic Forum, analytical thinking and creative thinking remain the most important skills for workers in 2023. Analytical thinking is considered a core skill by more companies than any other skill and constitutes, on average, 9% of the core skills reported by companies. Creative thinking, another cognitive skill, ranks second. Surveyed businesses report creative thinking growing in importance slightly more rapidly than analytical thinking (*The Future of Jobs*, 2023).

Creative thinking is *"a mental process involving the generation of new ideas or concepts, or new associations between existing ideas or concepts"* (Jackson et al., 2012, p. 370). Fundamentally, it involves *"the ability to produce novel work"* (Hargrove and Nietfeld, 2014, p. 2). Creative individuals typically exhibit a capacity to propose multiple solutions to a given problem (Torrance, 1974), often solving problems by *"juxtaposing several ideas not previously related to one another"* and contemplating novel arrangements of these ideas (Hargrove and Nietfeld, 2014, p. 3). While definitions of creativity vary, most agree that it involves both originality (novelty, uniqueness, newness) and effectiveness (value, appropriateness), conforming to the *"bipartite standard definition"* as highlighted by Runco and Jaeger, 2012 (e.g., Gajda et al., Karwowski, 2017; Walsh et al., 2017).

From a procedural perspective Sir Ken Robinson defines creativity as *"the process of having original ideas that have value"* (Robinson, 2015). The iterative processes, divergent and convergent thinking, and the use of tools for finding and building ideas are the culmination the previous project. The DT.uni model of design thinking directly supports the development of creative thinking skills through the *3i Approach to Design Thinking*, an interdisciplinary

framework where interdisciplinary teams engaging in innovation through (re)iteration (Arau Ribeiro, Lopes, and Gomes, 2020).

However, current research focuses on its practical implementation and emerging challenges in educational environments, revealing a dynamic landscape of creativity in contemporary academia. Karunarathne and Calma (2024) identified gaps in creative thinking skills among undergraduates, noting that these students excelled more in generating a diverse range of ideas than in producing creative ideas characterized by quality and originality. This could suggest that educators need to focus not only on encouraging idea generation but also on developing students' critical thinking skills to evaluate and refine their ideas. Additionally, while cognitive processes related to creative potential and development are well-documented, creative production's self-reflective and self-perceptive aspects have yet to receive equivalent scholarly attention (Hennessey, 2015; Silvia et al., 2016).

Building on this gap in the literature, this question was informed by the six clustered facets of teachers' conceptions of student creativity in learning identified by Jahnke et al. (2017). These conceptions of student creativity were used in the surveys, e.g. see Chapter *HEI Students in the Context of Creative Thinking*.

These facets include:
- Self-Reflective Learning: This facet focuses on students' reflective thinking during classes, their application of theoretical concepts to real-life scenarios, their combination of various concepts into new arrangements, and their making of cross-links between different areas of knowledge.
- Independent Learning: This facet gauges students' initiative and decision-making skills, especially in their research work such as Bachelor's or Master's theses, independently conducted projects or assignments like case studies, and their ability to progress without direct help from professors.

- Showing Curiosity and Motivation: This facet assesses students' enthusiasm for their subject or discipline, their propensity to ask challenging questions, engage in lively and critical discussions and their willingness to perform above average.
- Producing Something: This facet evaluates students' ability to create tangible outputs, such as websites in a Business English class, software architectures for training projects, podcasts instead of traditional papers, brochures, or explaining complex concepts like chemical facts through drawings.
- Showing Multi-Perspectives: This facet captures students' ability to deviate from standard strategies, examine problems from new and multiple perspectives, and think beyond the boundaries of their discipline.
- Reaching for Original, Entirely New Ideas: This facet assesses how students propose solutions or ideas unknown to their teachers, develop extraordinary ideas in well-known issues, engage in innovative experimental problem-solving, and venture into paths not traditionally followed or discussed in literature.

Karwowski et al. (2020) found that the perceptions of creative students among teachers from Italy and Poland were synthesized into three broad groups:

1. Cognitive traits typically associated with creativity;
2. Nonconformist and impulsive behaviours;
3. Adaptiveness.

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HEI Partners in the Context of Creative Thinking

Section 1: Introduction

This survey was developed specifically to ascertain the level and benefit of collaboration between universities and external partners, emphasizing the development of creative thinking. A central question was: Does active cooperation between universities and external partners influence the development of creative thinking and foster innovation? Exploring creative thinking in terms of originality, fluency, flexibility, and elaboration, as well as its perceived impact on innovation. The main objective of the survey was to comprehend the expectations and perceived obstacles regarding cooperating with the university's external environment in the context of creative thinking. Another objective was to define the main attributes of good cooperation between universities and external stakeholders and, at the same time, to identify their perception of creative thinking amongst university students.

The survey was part of a collection of four surveys aimed at evaluating the level of creative thinking and collaboration between students, lecturers, university management, and representatives from companies, NGOs, and local authorities within the context of their experiences collaborating with higher education. To achieve relevant and valid answers, the qualitative survey focused on a smaller number of respondents in a semi-conducted interview. The survey followed a logical sequence, beginning with the identification of external partners. Subsequent sections explored the nature of the collaboration, the motivations for cooperation, and the partners' evaluation of their experiences working with universities.

The following section provides a detailed overview of the survey structure and the data collection process.

Section 2: Survey Structure and Data Collection

The survey consisted of 28 questions divided into five main sections: identification of external partners, identification of cooperation, motivation, evaluation and closing. Data collection extended from May to November 2023. Each of the eight participating universities completed two surveys through a semi-conducted interview with the external stakeholders of their choice.

After evaluating the questionnaire, 16 relevant responses were selected and evaluated. Half of the external stakeholders identified as business companies (n=7); the other half were NGOs (n=4) and municipalities (n=3). Although eight of these had more than 250 employees, the rest were micro and small companies with 1-49 employees.

The initial section dedicated to identification included two open-ended questions out of a total of five (5), of which four (4) were mandatory and one (1) was optional. The second part consisted of eight questions – four (4) mandatory and four (4) optional and open-ended. Three of the eight werearray scale questions, and one was a one multiple-choice question where respondents could only select one answer. The third section of the survey examined the partners' motivation to cooperate. Of the four questions, two were array scale and mandatory, and two were open-ended and optional.

The survey's most extensive section to determine the quality of cooperation between universities and their external stakeholders consisted of 10 questions. The central open-ended and mandatory question was "How would you define good cooperation?" This was followed by another two open-ended mandatory questions and three (3) optional open-ended questions. Of the remaining four (4) array scale questions, the closing question was open-ended and optional.

Section 3: Evaluation of Selected Closed-ended Questions

1. **What are the expectations of cooperation with universities?**
   This question aimed to determine the importance of six predicted benefits as listed below.
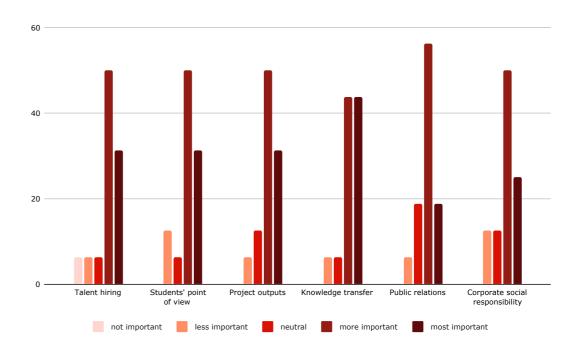
Fig. 1: HEI Partners: What are the expectations of cooperation with universities?

Our results show that cooperation with universities is expected to affect external stakeholders positively. *Knowledge transfer* is given the highest importance (43% of respondents declare it the most important), followed by *project outputs, student point of view*, and *talent hiring*. *Public relations* and *corporate social responsibility* are considered essential or very important by 75% of respondents.

2. What is your company's perception of creativity/creative thinking?

In this question, we examined the perceptions of creativity or creative thinking by the universities' external stakeholders to better understand what they expect and how they evaluate the level of creativity of the ten soft skills listed related to creativity in Figure 2. The list is the result of brainstorming with the CT.uni consortium.

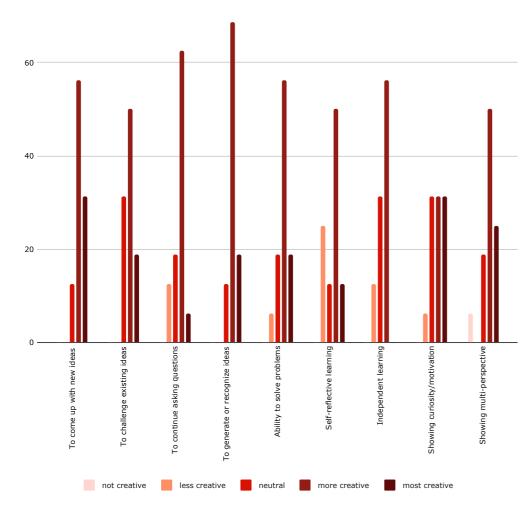Fig. 2: HEI Partners: What is your company's perception of creativity?

The top three skills described as the *most creative* were the *ability to come up with new ideas* (almost 32%) and *showing curiosity and motivation* followed by *showing multi-perspective*. In the following ranking, the *ability to create something*, followed by the *generation or recognition of ideas* and the *continued asking of questions* were described as more creative. Looking at the opposite end of the range, we found that 6% of respondents perceived *showing multi-perspective* as not creative and *self-reflective learning* (25%), *independent learning* (13%), and the *ability to continue asking questions* (13%) were considered less creative. *Independent learning, showing curiosity,* and the *ability to challenge existing ideas* were considered neutral (all at 32%).

3. How do you evaluate the quality of students in the following areas?

Respondents had the opportunity to score the quality of students on a scale of 1-5 in terms of their *inner motivation, proactive approach, good time management, good communication skills* and *hard skills*, as reported below in Figure 3.
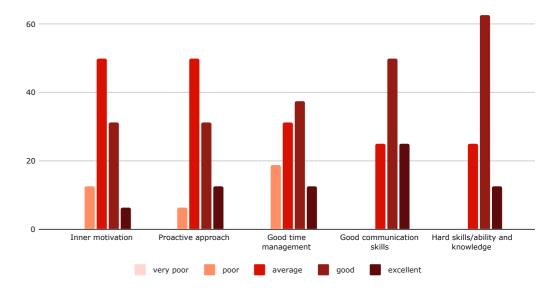
Fig. 3: HEI Partners: How do you evaluate the quality of students in the following areas?

According to our findings, *good communication skills* (with an average value of 4.0), followed by *hard skills* (3.987) and a *proactive approach* (3.5), were most positively rated. They felt that students need help with *time management*, with 50% of respondents rating this characteristicas average or poor. The greatest challenge is students' *inner motivation*, with an average value of 3.3. Only 6% of our respondents see students' skills in this area as excellent and 63% as average or poor.

4. How would you evaluate the quality of student outcomes?

External stakeholders had the chance to evaluate the quality of students' outcomes and the results were less optimistic than those in Figure 3.
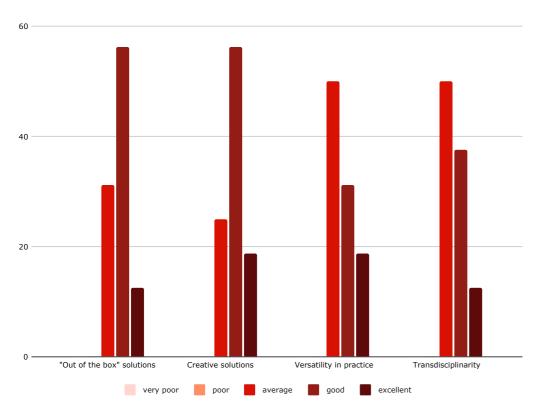

Fig. 4: HEI Partners: How do you evaluate the quality of students' outcomes?

Figure 4 shows that the average value for both *"out-of-the-box"* and *creative solutions* was 3.9 (out of 5); *versatility in practice* was 3.7; and *transdisciplinarity* was 3.6. While all four learning outcomes were evaluated at or above "average", 19% were evaluated as "excellent". We see the choices of *versatility in practice* and *transdisciplinarity* as challenging, given that 50% of respondents rate the *quality of student innovations* as "average" compared with just 19% consider them to be of "excellent" quality.

5. What do you see as the biggest barriers to maximizing the benefits of cooperation for both parties?

In this question, we wanted to explore the most serious predicted barriers. Results on a scale of 1 to 5 show that the average values were for *finance* (2.9); *time* (2.6); *dedicated staff for collaborating students* (2.6); and a *lack of purpose (motivation)* (3.5).

Finance was perceived as less of a barrier than we expected. More concerning were the perceived barriers of *time* and *dedicated staff for collaborating students*, both evaluated at a combined total of 63%, with none responding that time was "no barrier at all".
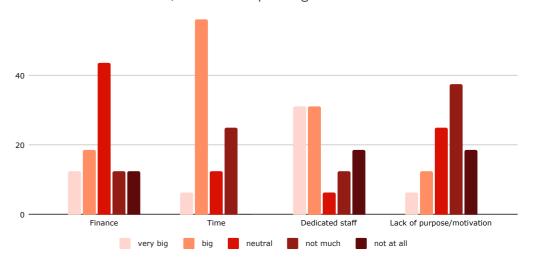

Fig. 5: HEI Partners: What do you see as the biggest barriers to maximizing the benefits of cooperation for both parties?

Section 4: Evaluation of Selected Open-ended Questions

The questionnaire also aimed to receive qualitative feedback from our HEI Partners as external stakeholders. The interviews were conducted with primary representatives of the consortium universities' external partners to provide specific, tangible, and authentic experience. The interviews aimed to better understand the approaches of both the university and the partner during past projects and work together on further improvements in the future.

In order to provide 360-degree feed forward, each quantitative question was supplemented by an open-ended section that would allow external partners to share their experiences. the benefits and challenges of cooperation, external partners' definitions of *creativity* and *innovation*, and their perceptions ofstudent engagement and the quality of their creations. These contributions provided important qualitative insights into the quantitative data.

Creativity

External partners were asked to describe their perspectives on creativity beyond the predefined characteristics. In the closed-ended question, they expressed their view on creativity and innovation. In addition to the predefined characteristics, external partners emphasized a *"brave approach to topics/go-getting"* and pointed out that *"creativity depends on attitude and a very broad spectrum of results"*.

Expectations

Some partners expect *"an attempt to translate our projects into the international arena by establishing cooperation."* Furthermore, they hope for *"implementation by other universities when sharing good practice, such as a reference cooperation within FabLab"*. Another partner suggested that collaboration with universities should also involve institutions and professionals in entrepreneurship to help refine ideas for market competitiveness. Another partner suggested that collaboration with universities should also involve *"other institutions and people operating in the field of entrepreneurship"* to help refine ideas for

market competitiveness. Lastly, partners expressed interest in co-developing patents and intellectual property with students. Moreover, cooperation with universities enables external partners *"to channel back at university and preserve the contact with new development and further education"*.

Benefits

A central research question was: *How do you define good cooperation?* Partners' responses provided a detailed set of indicators. This led to discussions on how to measure effective collaboration.

Given the diversity of responses, it is important to present them in detail, classified here in three areas:

1. Holistic Approach (win-win)
   The general response repeatedly emphasized the benefits for both sides: the partners and the university.

- *"When both sides meet their expectations (new ideas vs. new insights, learnings, good student experience)."*
- *"Good cooperation means satisfaction and benefit for both parties."*
- *"Where all the partners gain something (e.g., generating tangible outputs, increasing knowledge or social awareness, personal growth), and something is done for society."*
- *"A cooperation in which the collaborating partners learn something from each other or have useful project goals or outputs for all partners. The project goals that are set out initially are (mostly) achieved."*

2. Focus on Output
   Even though many of the statements overlap, slight differences can be tracked. The pragmatic approach sought the reason and purpose of cooperation when focusing on the project outputs and outcomes, considering the synergy of the academic and

business worlds. Some of the partners considered that the essential condition and sign of good cooperation.

- *"Integration of research with the professional world."*
- *"Better response to social and economic challenges in the regions where we operate."*
- *"A strong collaboration entails a synergistic and efficient professional association among individuals or collectives to attain mutually agreed-upon goals or objectives."*
- *"The concept encompasses the efficient amalgamation of endeavours, concepts, and assets, wherein all entities engaged collaborate in concordance, confidence, and reciprocal esteem. Several essential factors contribute to establishing effective cooperation: communication, trust, respect, language, and an interesting and innovative look at foreign nationals as co-workers who are jointly integrated as a multinational team but with a common goal."*
- *"The ability to work together with the same purpose. Cooperation is a way to implement things through group ideation, communication, and execution."*

3. Focus on Interaction

The last category synthesized the interaction of interested parties: the university, students, lecturers, and external partners throughout the process. The experience shows a strong focus on the soft-skill capabilities of interested parties, which were strongly perceived and commented on by external partners.

- *"Good cooperation exists when we exchange knowledge and talents."*
- *"Creating value, exchanging knowledge and developing resolution capabilities."*
- *"Active communication and cooperation in creating the structure of lectures."*
- *"Correct understanding of the topic, high motivation of students, students independently look for new ways to solve problems, motivation for new ideas, look beyond the boundaries of ordinary possibilities, quality of design performances."*

Challenges

In addition to examining the benefits of cooperation, the questionnaire also explored key challenges faced by HEI Partners. *What challenges do you face in your current cooperation with universities?* Many respondents were willing to answer this question boldly, so a further sub-division into another three categories is offered.

1. Time Synchronization

One of the main challenges identified was time synchronization. The pace of academic work often differs significantly from industry timelines, leading to coordination difficulties. While some delays are inevitable due to structural differences, misalignment between academic and industry timelines can create significant obstacles.

- *"Academic times are often longer than in organizations, especially business ones."*
- *"We want to develop cooperation on further projects so that projects do not appear randomly, occasionally, without proper preparations. When we are ready with a project brief, the semester is already at full speed, or vice versa. Coordination is needed, but there are too many factors we as a state institution can not control."*
- *"Maintain liaison and the pursuit of projects."*
- *"The requirements in study programs (reporting and assessment) differ from those often required in the organization."*
- *"Legal situations and internal possibilities are difficult. Universities are not using these corporations and collaborations synergically. What's more, there are sitting egos at certain universities' chairs."*
- *"Lack of time at the university to initialize and supervise projects."*
- *"The preconditions of universities (especially legal aspects) take too much time."*

The university environment, conditions, and equipment were also observed and questioned. Apart from naming the importance of *"quality of laboratories and gaining practical experiences, possibility of internship access, quality of professors and staff"*,

the *"international scope"* was considered significant. Some partners appreciate *"dedication and commitment"* and *"quality of outputs at a high level"* by using the existing (institutional) potential. The university's role and responsibility were also seen in the *"translation of scientific outcomes to something of societal relevance"*. However, some reawakened that the *"mindset of the students is most important, not the conditions around the students"*. Regarding specific student qualities, sensitivity to social issues has considerably increased, specifically regarding aid and conflict in Ukraine.

2. Results vs. Process
   Another challenge we could observe from qualitative data is the neverending collision between the importance of Results and Processes. While companies naturally focus on results, the academic system evaluates the process and how the solution emerged and was developed.

- *"I am not facing a huge challenge working with the universities. Sometimes, companies and universities have different approaches to dealing with practical projects. Speaking about projects, companies want immediate results (the good enough approach), and universities want the best results ever. University decisions are based on science, while companies' decisions are often based on business needs. Integrating these differences could create the right balance between learning and the student's development. Working constantly with the Universities can lead to a much higher quality of candidates for the companies."*
- *"Lack of projects and involvement that bring effective value to the organization."*

3. Students' Approach
   Finally, a key concern for educators is student engagement.. While partnerships and and projects are in place, the level of student participation and enthusiasm remains an inherently variable factor that can be difficult to predict. Our research shows that this is present across the countries and universities of the consortium.

- *"Communication with the university, with teachers, motivation of students – if you ask me about the challenges."*
- *"Students are passive in lectures, not adding value to the work performed."*
- *"Proper motivation of students, finding enough time for consultation: Student motivation has been lower in recent years. We need proper explanation and grasping of the topic, proper presentation of outputs and ideas."*
- *"Connecting young people with Lublin, which will contribute to the economic development of Lublin; creating new fields of study; adapting to change (AI); motivated to actions; wise use of social media; clear communication with peers; lack elements of creativity/creative thinking in the core curriculum; show various future career options; stimulating soft skills (self-fulfilment, communication, teamwork, self-presentation, conscientiousness); work on quality."*

Section 5: Summary of HEI Partners Survey Responses

The research confirmed both the benefits and challenges of cooperation between universities and external stakeholders. However, discussions and interviews have provided deeper insights into specific experiences and offered suggestions for refining future collaborations.

Quality cooperation benefits both sides, particularly by generating tangible outputs, increasing knowledge and social awareness and contributing to personal growth. The project's societal impact and relevance reinforce stakeholder satisfaction. Respondents see this as validation of the project's purpose, which in turn motivates them to pursue further collaborations. Respondents identified key challenges as *time* and *legal synchronization* between cooperating parties (e.g. administrative preparation of the project, procedural requirements, and assessment methods), *different priorities* regarding results vs. process and *passive student engagement*.

Several recommendations arose for increasing the impact of future projects.
One key suggestion was to *"involve small and medium-sized enterprises more, to bring outputs to the entrepreneurial level as it is nevertheless the economic-social engine"*.
This would translate academic outputs into entrepreneurial opportunities, recognizing their role as economic and social drivers. Some respondents emphasized the importance of *"openness to cooperation in the STEAM trend: the future challenge would be a joint international project aimed at diverse audiences"*, building on their prior positive base experience.

Partners highlighted the long-term benefits of research collaborations, emphasizing that research *"should not just be limited to a student or a seminar but seen as a long-term commitment for cooperation to build up an intense knowledge transfer (the university has academic insights; business has practical insights)"*.

Finally, authors of the chapter were asked to identify three key insights resulted from HEI Partners Survey. Further elaboration of key insights per each chapter will be discussed in the Conclusion chapter. The key insights of HEI Partners Survey are the following:

- 63% of external partners evaluated time as a big or very big barrier when naming the biggest barriers to maximizing the benefits of cooperation for both parties.
- 50% of respondents consider the quality of transdisciplinarity and usability in the practice of students' outcomes only as average, whereas nearly 19% consider them excellent quality.
- Students have problems with time management, where 50% of respondents see it as average or poor.

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HEI Managers in the Context of Creative Thinking

Section 1: Introduction

As part of efforts towards *Codifying Innovation in Learning and Teaching*, a survey was conducted in the summer of 2023 among university managers. experts surveyed included program and line managers responsible for overseeing content and learning outcomes within their faculties.

The survey was an online questionnaire for university managers. Researchers gathering responses were encouraged to conduct structured interviews, with the option of using the survey as a data collection tool. The decision to supplement the online survey with structured interviews was made to gather more detailed responses to open-ended questions because respondents tended to provide short, focused answers. These structured interviews allowed researchers to encourage reflection and elicit additional context from managers.

The aim was to collect their views and attitudes on creativity as an integral part of student learning, how (if at all) creativity is encouraged or trained within the programs, and specific strategies or activities to train students in thinking creatively. Secondly, the survey draws attention to universities' collaboration with external partners and the role of such cooperation in enriching the students' learning experience.

The survey complements other data-gathering efforts within the overall goal of *Codifying Innovation in Learning and Teaching*. The views and opinions of managers overseeing individual study lines are essential, as they are in a position to affect teaching methods, learning outcomes, and skills that courses within that line foster.

Section 2: Survey Structure and Data Collection

The survey was developed by members of the CT.uni team and administered to a sample of university managers, primarily from the consortium's universities. The survey was set up as a form in Limesurvey for online completion of the questionnaire. When possible, researchers conducted structured interview and supported respondents with data entry into the survey software. The aim was to obtain detailed responses to open-ended questions by giving the interviewer a chance to reiterate questions and encourage respondents to elaborate whenever possible. Sometimes, a structured interview was impossible, so some respondents completed the questionnaire themselves.

The survey included 20 questions, with one conditional question presented to a subset of respondents. Eight questions required open-ended responses, while twelve were closed-ended, six of which used Likert or frequency scales to evaluate five to nine items. The final sample included 49 interviews. Notably, most respondents identified with the Arts, Letters, Humanities, and Social Sciences within the STEAM framework. reflecting the composition of the CT.uni team and the integration of the "A" into the more established STEM terminology.
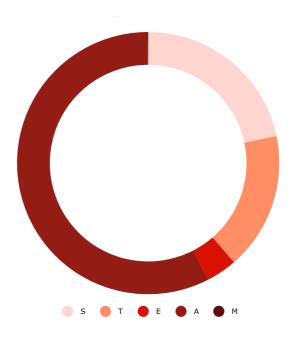

Fig. 6: HEI Managers: Classification of the study area within the STEAM framework

Section 3: Evaluation of Selected Closed-ended Questions

The survey explored two interconnected strands concerning creativity in the classroom. The first set of survey items focused on means and strategies to promote the teaching of creativity. Initial questions on *what it means for students to think creatively* aimed to spark ideas and reflection, setting the stage for later sections. The second set of questions examined guidelines or encouragement to teachers or even department policy on creative thinking. While program managers may advocate for creativity in course curricula, implementation is ultimately left to the lecturers. The final set of questions emphasized the university's collaboration with external partners or stakeholders, the nature of that collaboration, intended outcomes, and their perceived motivation for the partnership.

1. Creativity in the Classroom

Respondents largely agreed that students thinking creatively meant that they were *creating something, showing curiosity, generating ideas,* and displaying their *ability to solve problems.*
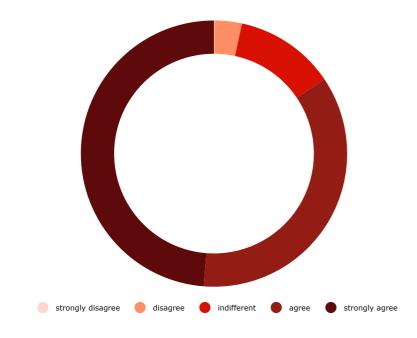
Fig. 7: HEI Managers: Creativity means the ability to create something

Respondents were mainly in agreement when asked if they actively encouraged lecturers to train creative thinking with students in their courses. They were also somewhat opposed to leaving creative instruction entirely to either the students or the lecturers. This result clearly indicates that creativity is seen as a valuable and teachable skill in an approach of shared responsibility.

Fig. 8: HEI Managers: Creative thinking is actively encouraged and stimulated in the courses

Universities set strategic targets for their programs and rely on policies to guide their efforts, for example, when developing new programs, updating and improving teaching methods, and engaging with society.

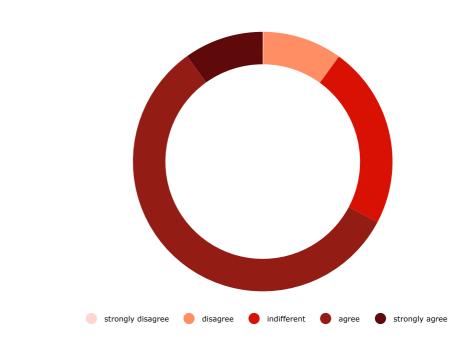However, no universal policy model is in place, and strategies are typically the outcome of deliberation within faculties considering numerous factors. When asked, nearly half of the managers indicated that their policies explicitly included creativity as a learning objective. Moreover, over half of the respondents stated that their policies mandated some encouragement of creative thinking across all courses.

strongly disagree   disagree   indifferent   agree   strongly agree
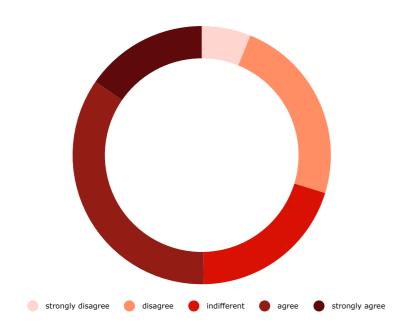
Fig. 9: HEI Managers: Clear policy to encourage creative thinking in all course

2. **Cooperation with External Partners**

Respondents reported that their departments collaborated with external partners to enrich their study programs. he most common forms of collaboration included *direct contributions to lectures* or *internships*. Other forms of collaboration, though less frequent were contributions such as participating in student workshops or providing the context for a case study.

never   rarely   sometimes   often   always
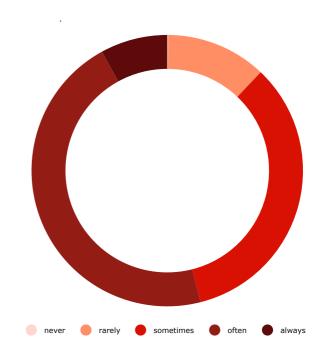
Fig. 10: HEI Managers: Cooperation activities – direct contribution to lectures

Most respondents saw cooperation as a way to enrich students' learning experiences and strengthen ties with industry and potential employers. This was considered mutually beneficial, as external partners primarily wanted to recruit students for future employment. Connecting with researchers and leveraging student contributions to creative work were also key factors.

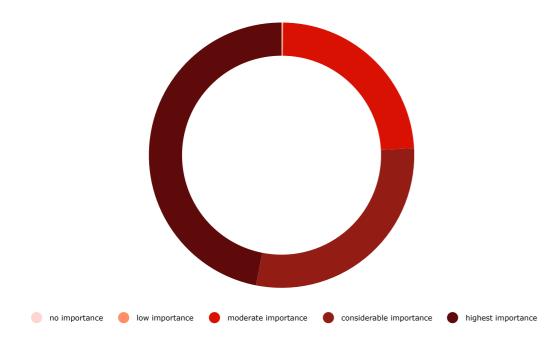no importance   low importance   moderate importance   considerable importance   highest importance

Fig. 11: HEI Managers: Cooperation motivations – student recruitment for future employment

Section 4: Evaluation of Selected Open-ended Questions

1. **Who are your external partners? Are any of these cooperations STEAM related?**
   Out of the listed options, participants identified banks, hospitals, and secondary schools as their external partners. One participant mentioned funding organizations and the European Commission as their external partners. artnerships may begin through research collaborations or academic programmes, which can result in more innovative curricula, internships for students, and start-ups.

2. **How would you describe the nature of your cooperation with external partners?**
   Participants noted that the universities often serve as expert consultants, providing specialized knowledge and opinions. Two participants mentioned projects with external partners from the industry. Most participants described the nature of their cooperation as *integrated collaboration*, where they share and exchange knowledge and experience, provide impulses, and create networks and (new) partnerships. Cooperation may be short-term or long-term. In direct connection with education and students, the participants mentioned field trips and cooperative support, specifically in the final research thesis.

3. **Why do you think these organizations wish to cooperate? What is their motivation?**
   Besides the motivation options given on the list, the participants specifically mentioned the possibilities of using university laboratory capacities, accessing university services, and collaborating on risky projects. External partners are motivated by the opportunity to leverage university resources for problem-solving and product innovation. A majority mentions the exchange of expertise and experience. One participant mentioned employing students already before they graduate. Some external partners are also motivated by teaching opportunities and financial incentives. Many external partners cooperate with the university because of such a vision of their enterprise. One participant said that the motivation could influence the university to establish future socio-business relationships.

4. **What motivates you to seek their cooperation?**

   Beyond the listed motivations, participants identified three key perspectives:

- Educational, where they connected students with industry and their future employers to motivate students through real-world problem solving;
- Professional perspective: Engaging in specialized professional development, generating new ideas, developing products, networking, participating in corporate practice, launching new projects, and commercializing solutions developed at the university; and
- Societal perspective: Addressing regional challenges and enhancing th universities national and international recognition and building prestigelong-term development, enhancing the universities' national and international recognition and building prestige.

5. **What do you see as the biggest barriers to maximizing the benefits of cooperation with external partners for both parties?**

   Participants pointed out time constraints, particularly the time needed to design student assignments. They mentioned that the capacity (inflexibility) of the study programme to implement new methods is a barrier, as well as the resistance of the teaching staff to implement new methods on a larger scale. Several participants further identified poor communication skills, formal matters, and intellectual property matters as another barriers.

6. **What signifies success in cooperation with external partners, and how can success be measured?**

   Participants identified the following key indicators of successful cooperation:

   - indicators directly related to students, such as positive reactions in student surveys and the number of students that get work/are hired based on the cooperation;
   - indicators related to individual project success: initiation of follow-up projects and production of publishable or usable results;

- indicators related to cooperation in general: number of cooperations and started networks, number of projects, duration/ongoing cooperation, new knowledge/new experience, income from services offered, scientific development of staff;
- indicators related to reputation and societal visibility: awards, local, regional, and international publicity, and exhibitions.

Section 5: Summary of the HEI Managers Survey Responses

Respondents largely agreed that thinking creatively involves actively exploring and generating ideas, challenging assumptions, and creating something new. Students demonstrated curiosity and problem-solving ability.

University-partner cooperation barriers are time constraints and the need for greater flexibility since the academic calendar often makes it difficult to integrate problem-based challenges into courses or programs.

A successful cooperation model involves an external stakeholder proposing a challenge while providing timely access to data and expert interviewees.

Viewing cooperation as a low-cost, low-risk venture, external partners may be more open to innovative and creative problem-solving approaches. For universities, engaging with such challenges enriches their students' experiences, adds relevance and variety to courses, and strengthens their societal impact. Students develop their skills by engaging firsthand with real-world challenges, moving beyond abstract textbook scenarios. This interaction provides students with a stronger platform to showcase their skills, offering future employers deeper insights than traditional hiring processes.

Again, authors of the chapter were asked to identify three key insights resulted from HEI Managers Survey as a conclusion of their research. Further elaboration of key insights per each chapter will be discussed in the Conclusion chapter. The key insights of HEI Managers Survey are the following:

- Aside from being pressed for time, university managers often face a lack of flexibility in setting up and implementing partnerships with partner organizations. The academic calendar typically allows for very little flexibility if problem-based challenges are to be solved within specific program courses.
- A model for good cooperation could be a scenario where a stakeholder external to the university suggests a challenge and can provide timely, first-hand access to data and expert interviewees. With relatively low stakes, a partner may be open to supporting a creative and novel approach to problem-solving, giving students a chance to think creatively and to explore and generate ideas actively.
- For the university, gaining access to such challenges enriches their student's experience, adds relevance and variety to courses, and contributes to the university's societal impact.

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HEI Teachers in the Context of Creative Thinking

Section 1: Introduction

This chapter summarizes the survey findings from lecturers at eight European higher education institutions (HEIs) in Europe that use creative thinking in teaching-learning. The main objective was to evaluate the extent to which creative thinking is integrated in curriculum development in higher education.

We aim to understand lecturers' perceptions of creative thinking approaches with their students and external stakeholders. We have been able to identify political strategies in HEIs by gathering examples of innovative HE curricula and collecting strategies for academics to integrate and assess the suitability of creative thinking approaches for courses and other student learning formats.

Section 2: Survey Structure and Data Collection

The consortium partners IPG and TUD developed a survey according to the objectives. This involved a process of brainstorming, brainwriting, and reviewing the literature to identify key questions. The main expected outcomes of the research, aligned with the identified goals, were to identify the level of creative thinking implementation in STEAM classrooms; define area(s) of study where lectures use creative thinking with their students; perceive how teachers define and evaluate the creative thinking in their students; and identify how stakeholders value creative thinking in STEAM contexts.

Designed using Lime Survey and available from May to December 2023, the sixteen multiple-choice and open-ended questions were distributed across three sections: demographics, lecturers' perceptions of creative thinking approaches in their classrooms, and creative thinking and external stakeholders, as outlined in Table 1. The respondents could select and/or rank among several predefined statements on a Likert scale from 1 to 5, ranging from "not important" to "very important" and "totally disagree" to "totally agree".

We aimed for a total of approximately 320 responses, with each of the eight consortium partners collecting responses from at least 40 lecturers and fewer from the smaller HEIs, IPG and Bifröst. In the period from May to December 2023, we received a total of 272 responses to the CT.uni HEIs Teachers' Questionnaire, corresponding to 85% of our target.

In the CT.uni survey cohort, the most represented STEAM classification (51%) is in the Arts, Letters, Humanities, and Social Sciences (e.g. pedagogy, economics and business, administration, law, literature & linguistics, history). The other 49% represent the total STEM classified areas of study, where *Science* is represented by 24%, *Technology* and *Engineering* are both at 10%, and *Math* is at 5%.

Table 1: The structure of the CT.uni online survey of HEI Teachers

Section	Questions
Section 1: Demographics	1. University 2. Course level(s) taught 3. Area of study classified into the acronym STEAM
Section 2: Creative thinking approaches in the classroom – lecturers' perceptions	1. What it means when students are able to think creatively 2. Use of creative thinking with my students 3. Area(s) of study where creative thinking approaches are applied 4. Importance of developing creative thinking 5. Appreciating uncertainty when using creative thinking approaches with your students 6. Barriers to using creative thinking approaches with students 7. Gaps in your infrastructure – methodological and/or technological 8. Strategies that help you create lesson plans that involve creative thinking
Section 3: Creative thinking and external stakeholders	1. Collaboration with external stakeholders 2. Relevance of external stakeholders 3. Key ingredients to successful collaboration with external stakeholders 4. What makes a challenge meaningful when working with external stakeholders 5. Already developed creative thinking challenges

Section 3: Evaluation of Selected Open-ended and Closed-ended Questions

When relevant, closed-ended questions were followed by an open-ended prompt to elaborate the sharing aspect of the survey while listening to the teachers.

1. **Classroom Experience with Creative Thinking Approaches**
   Most of the 272 HEI teachers surveyed are currently applying creative thinking (later in the text CT) approaches or have been involved in CT approaches with their students. The 189 actively engaged (70%) were invited to share more about their experiences, as shown in Figure 12.

   Among the 189 teachers using CT approaches, 95% considered developing students' creative thinking essential.
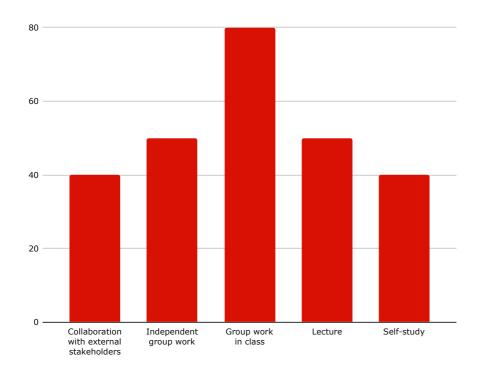
Fig. 12: HEI Teachers: Classroom experience with creative thinking approaches

Nearly 80% of these lecturers plan for CT approaches for *group work in the classroom*, reinforcing the potential of fostering creative thinking through group work as an excellent approach to encourage collaboration, problem-solving, and innovation. Through collaborative teamwork in a supportive and inclusive environment, creative thinking processes can develop essential skills that go beyond the specific project results *per se*. More than half of the lecturers indicated *independent group work* and *lectures* as other essential activities for creative thinking approaches, thus finding a role for creative thinking beyond the classroom and in their lectures. At just under 40%, lecturers also reported applying creative thinking approaches in *collaboration with external stakeholders* and in *self-study*.

2. Perceptions of Creative Thinking in Students

The consortium surveyed students, administrators, and external stakeholders to determine perceptions of what it means for a student to be able to think creatively. For the teachers evaluated, Figure 13 represents the overall perception of students' ability to think creatively for each attitude and behavior.

The responses of "most likely" (83%) were most registered by the option *generating or recognizing ideas*, followed closely by *the ability to create something, the ability to solve problems*, and *showing multi-perspective*. The option *independent learning* (organizing decisions for learning autonomously) generated the highest number of responses midrange (33%). Finally, the three options *continuing to ask questions*, *independent learning*, and *self-reflective learning* were considered "least likely".

The ranked order of lecturers' perception of behaviour that shows creative thinking follows, although even the lowest ranking represents 84% of the responses:

- generating or recognizing ideas
- the ability to create something
- the ability to solve problems
- showing multi-perspective
- showing curiosity, resilience, and motivation
- challenging existing ideas
- self-reflective learning
- independent learning (organizing decisions for learning autonomously)
- continuing to ask questions

Note, however, that the average results for the Likert scale were not evenly distributed, ranging from "least likely" (8%) to midrange (21%) to "most likely" (70%). This indicates that the selection of responses in the research design could have included other less affirmatively biased options for more balanced results.

When asked how much they *appreciate uncertainty when using creativity with [their] students*, only 3% of the combined responses for not much appreciation contrast with a combined total of 97% responses from midrange (3, at 25%) to more affirmative (4, representing the most common response at 44%) to *very much* appreciation for uncertainty (5, at 30%) when using creativity with their students.
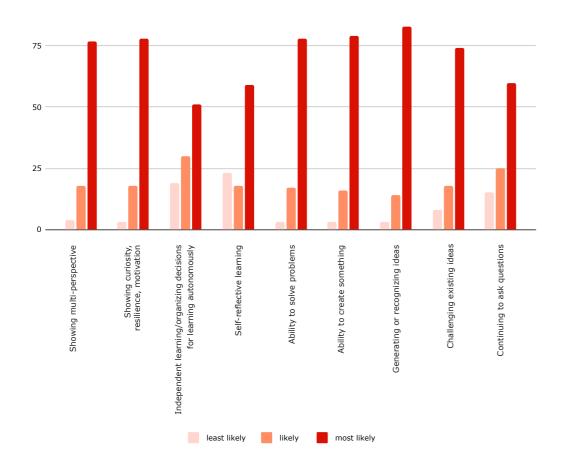

Fig. 13: HEI Teachers: Teachers' perceptions of students' creative thinking

Despite the overall appreciation, only 30% clearly understand uncertainty tolerance as an important factor when releasing their control over students to give them agency and autonomy. This indicates a potential area for improvement in using creative approaches. Specific areas to develop that require uncertainty tolerance can include risk management, adaptability, critical thinking, creativity, and emotional intelligence.

3. **Using Creative Thinking in the Classroom**

   Identifying the potential barriers to using creativity with students, one-third (33%) of the lecturers point to the *lack of familiarity with methodologies* for using creativity in the classroom, indicating the need for innovative teacher training in creativity. Other barriers reported in descending order were *missing stakeholder/contractor/user/third party/client, curricula and time restrictions* (26%), and *other teachers/administration* (8%). Only 3% reported students' mindsets as a barrier to using creative thinking in the classroom.

   Additional perceived barriers to using CT in the classroom are multifaceted and include issues such as inadequate educational materials, low student engagement and motivation, a perception of teaching as undervalued, and excessive rules and bureaucratic constraints. Other challenges encompass a lack of critical thinking skills, societal pressure for conformity, fear of failure, low self-esteem, and cultural barriers. Structural limitations, insufficient funding, and the absence of training in open-minded thinking contribute to the obstacles. The sheer size of classes, a preference for passive learning, and the prioritization of scientific publications over teaching further complicate the integration of creativity into education. Additionally, concerns about time constraints, the complexity of technology, and the need for adequate physical space for creative experiments underscore the difficulties faced by educators.

   Overcoming these barriers requires a comprehensive approach that addresses cultural norms, administrative practices, and the need for professional development in creative teaching methodologies.
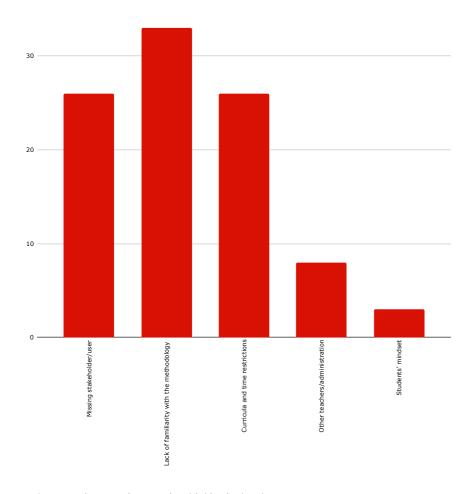
Fig. 14: HEI Teachers: Barriers to using creative thinking in the classroom

4. Infrastructure – Methodological and/or Technological

Teachers encounter additional multifaceted gaps in the infrastructure when trying to implement creative thinking in classrooms, encompassing issues such as d*evices, digital platforms and collaboration software, prototype solutions, teacher training, practice talking, teaching material, knowledge exchange, supervision for courses,*

and *challenges from external stakeholders*, as shown in Figure 15. The main gaps identified in the methodological and/or technological infrastructure were *training* (59% total of "agree" and "totally agree" responses), *knowledge exchange* (49% total of "agree" and "totally agree" responses), and *practice talking* (45% total of "agree" and "totally agree" responses), largely understood as structured opportunities for professional discussion.
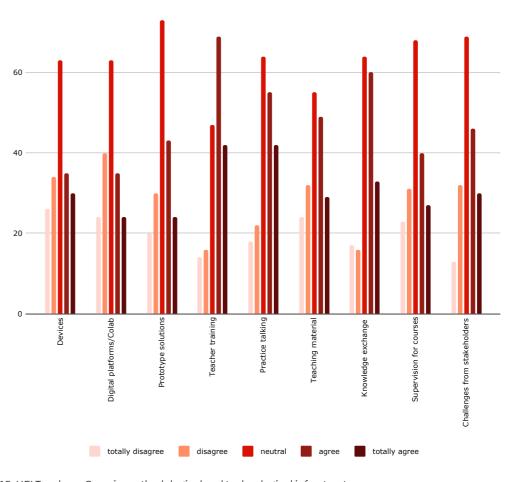

Fig. 15: HEI Teachers: Gaps in methodological and technological infrastructure

5. Strategies to Create Lesson Plans Designed to Enhance Creativity with Students

Among the strategies for enhancing students' creativity, most teachers agree that *challenging students to collaborate* (98%), *evaluating new ideas* (96%), *promoting innovative learning activities* (95%), *dedicating time to develop empathy within groups* (94%), and *including short activities to practice creative thinking and resilience* (91%) are among the most promising activities/plans to boost students creativity, as shown in Figure 16.
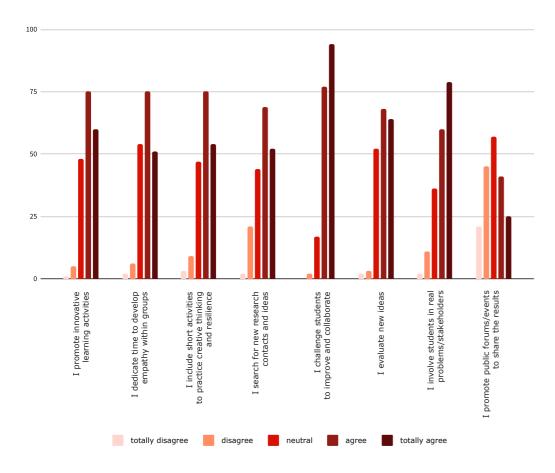

Fig. 16: HEI Teachers: Potential of strategies to create lesson plans to encourage creativity

In an open-ended question to complement the strategies provided in the survey, the other strategies suggested for creating lesson plans included initiating the pivotal steps of complex unstructured problem assignments, connecting students to real-world problem-solving scenarios, and embracing Design Thinking with an introduction to an error culture. Incorporating field trips and utilizing diverse teaching methods such as circle times, jigsaw classrooms, role-playing, and case studies can foster a dynamic and engaging learning environment. Encouraging student participation through surveys to align expectations and goals, integrating actual samples from technological processes, and organizing workshops with external experts for diverse perspectives contribute to a richer educational experience. Additionally, film screenings with critical evaluations and visits to cultural institutions broaden students' horizons.

Overall, actively involving students, sharing responsibility, and leveraging their diverse knowledge and experiences are further strategies that contribute to a holistic and creative learning atmosphere.

6. Types of External Stakeholders Relevant to Teaching

The results from external stakeholders show that although *government institutions*, *local authorities,* and *non-governmental organizations* are important, stakeholders in teaching, such as *research institutions* (75%) and *businesses* (63%), are considered the most relevant entities (Figure 17).

7. The Importance of Collaboration with External Stakeholders

Lecturers rated the importance of collaboration with external stakeholders on a scale from 1 ("not important") to 5 ("very important"). As shown in Figure 18, only 8% of respondents rated collaboration with external stakeholders as unimportant, while 92% considered it valuable: 22% midrange (3), 41% affirmative (4), and 29% very important (5). This response supports collaboration with external stakeholders to enhance creative thinking.
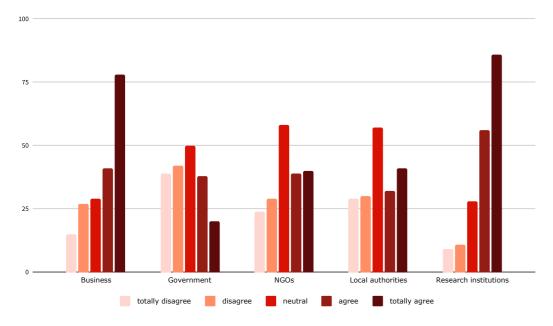
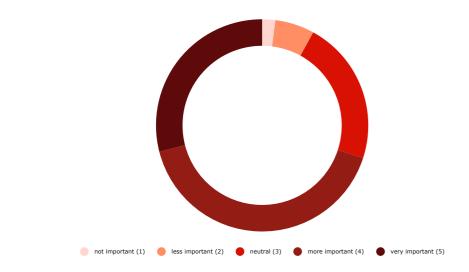Fig. 17: HEI Teachers: Relevant external stakeholders

Fig. 18: HEI Teachers: Importance of collaboration with external stakeholders

Identifying other types of stakeholders that are relevant to their teaching, responses indicated that the private sector, including landowners and self-governments of cities and municipalities, plays a crucial role. They also note that engaging with employees from different university departments fosters interdisciplinary collaboration while involving families and friends of students, along with other students within the university, creating a supportive network. External stakeholders, such as members of the local community, informal contacts, and organizations from afar, contribute valuable ad hoc collaborations, and they also point out that secondary schools and other educational institutions, as well as courts' actors and jail experts, broaden the spectrum. Maker spaces and marketing companies represent further dimensions of stakeholders in the educational ecosystem.

8. **Key Ingredients to Successful Collaboration with External Stakeholders**
In identifying the key ingredients to a successful collaboration with external stakeholders, lecturers responded most favourably to *knowledge transfer, meaningful challenges, student access, and research collaboration*, in descending order as shown in Figure 19.

Survey participants added other aspects like, when students address real-world challenges and respond to business issues, the challenge becomes meaningful. Other aspects, such as working on genuine projects with companies, provide an opportunity to apply and showcase their skills beyond the university setting, allow students to experience the real-world environment, and gain appreciation from external stakeholders who view students as valuable resources rather than burdens. Additionally, students can undertake paid internships, enhancing their practical exposure and opening up job opportunities after graduation. This collaborative approach fosters a connection between academia and industry, where stakeholders genuinely care about the outcomes and offer valuable real-world feedback.
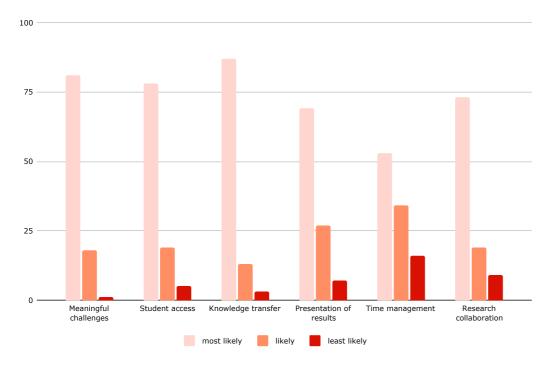
Fig. 19: HEI Teachers: Key ingredients to successful collaboration with external stakeholders

Section 4: Summary of HEI Teachers Survey Responses

Creative thinking has long been a focus in psychology, organizational behaviour, and management, where decision-making, leadership, innovation, and uncertainty tolerance are recognized as crucial for creative work. For students to embrace ambiguity, take risks, remain flexible, and foster a mindset of continuous learning and growth, teachers must also feel comfortable. Appreciating uncertainty in the context of creativity with students is about nurturing a mindset that values exploration, resilience, adaptability, and open-mindedness. Uncertainty tolerance prepares students not just for specific creative tasks but for a future where uncertainty is a constant, and navigating it becomes a valuable life skill. By embracing uncertainty, students and teachers come closer to opening doors, windows, gateways, and horizons towards their creative potential to generate innovative ideas.

In developing teacher training for creative thinking approaches in the classroom, we recognize the wealth of exploring heuristic strategies, like problem-based and game-based learning, based on challenging problems, real-life scenarios, practical exercises, and teamwork. Training can also reinforce positive teacher attitudes and supportive factors, such as the relationship between lecturers and students and amongst the students, to facilitate a creative learning environment.

Adjusting curricula and improved collaboration of external stakeholders should also contribute positively to removing barriers perceived by teachers who would like to be more involved in creating opportunities for creative thinking in their students.

We aim to understand lecturers' perceptions of creative thinking approaches with their students and external stakeholders. We have identified political strategies in HEIs by gathering examples of innovative HE curricula and collecting strategies and techniques for academics to assess the suitability of creative thinking approaches for courses and other forms of student learning formats.

Implementing creative thinking in the classroom is not a simple task. It requires a holistic approach that addresses the multifaceted barriers. Teachers can enhance the learning experience by advocating for more appropriate educational materials, fostering active student engagement, and challenging the prevailing perception that creative teaching is undervalued. Efforts to reduce excessive rules, bureaucratic constraints, and initiatives to instill critical thinking skills and overcome cultural barriers are essential. Providing support for transdisciplinary mixed teams, creating physical spaces conducive to creative experiments, and offering training in open-minded thinking are integral steps toward fostering a more innovative and dynamic educational environment.

Ultimately, a concerted effort is needed to shift the educational paradigm, emphasizing creativity, student empowerment, and the intrinsic value of teaching.

Lastly, three key insights resulted from HEI Teachers Survey follow. You can find further elaboration of these key insights in the Conclusion chapter.

- One-third of the teachers reported being unfamiliar with methodologies for using creativity in the classroom, indicating the need for innovative teacher training in creativity.
- Among the strategies for enhancing students' creativity, most teachers agree that challenging students to collaborate, evaluating new ideas, promoting innovative learning activities, dedicating time to develop empathy within groups and including short activities to practice creative thinking and resilience are among the most promising activities/plans to boost students' creativity.
- Teachers understand that collaboration with external stakeholders is essential to enhance and develop creative thinking in the classroom. Government institutions, local authorities, and non-governmental organizations are important stakeholders that should be integrated into the classroom to develop projects and use creative thinking.

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HEI Students in the Context of Creative Thinking

Section 1: Introduction

This survey is a strategic instrument developed to tap into students' insights about external stakeholders as they navigate their educational paths. Its main goal is to synergize academic theories with the practical realm, examining how external collaborations influence students' creativity and intellectual growth. The questionnaire starts with demographic information (university affiliation, age, gender, level of study, and field of study) before moving on to students' creative thinking and their interactions with external entities.

The questionnaire moves from demographic data to examining students' interactions with external stakeholders, including businesses, NGOs, and government agencies. interactions help students gain practical skills alongside theoretical knowledge, an essential combination for modern education.

Through a series of matrix ratings, single-choice questions, multiple-choice questions and optional responses, the survey examines students' educational experiences, including teaching methods,creative thinking training, and interactions with external partners.
It examines both the challenges and benefits of engaging with external stakeholders, including institutional barriers and motivational factors.

The survey aims to evaluate students' current and future interactions with external stakeholders, assess their impact on creative and critical thinking, and identify ways to strengthen these collaborations. strengthen partnerships with external stakeholders to enrich student learning and innovation.

Section 2: Survey Structure and Data Collection

As part of the CT.uni project (EKEUBA-KA220-HED-7/2023), the questionnaire consisted of 24 questions approved by the Ethics Committee of the University of Economics in Bratislava. It was designed to capture a spectrum of student experiences and insights on integrating external stakeholders into education, with a focus on cultivating creativity as an integral part of their educational journey.

The survey included two optional open-ended questions: Q12b ("Please indicate other external stakeholders you have had any contact with, if any.") and Q21b ("What other external stakeholders would you like to have more frequent contact with in the future (if any)?"). These allowed students to describe their experiences and aspirations in their own words.

The questionnaire consisted of 22 required closed-ended questions. The questionnaire was divided into four sections:
1. Demographics: Six questions on university affiliation, age, gender, level of study, field of study, and STEAM classification.
2. Creative Education Perceptions: Five questions on students' views of creative learning in HEIs.
3. External Stakeholder Engagement: Ten questions on students interactions with external stakeholders.
4. Three questions on students' preferences for future collaborations with external stakeholders.

Conducted from April 24 to December 22, 2023, the survey was distributed via an anonymous Qualtrics link. Completing the questionnaire took an estimated 8-10 minutes.

No.	University	%	Count
1	IPG, Guarda	16	84
2	STU, Slovenská technická univerzita v Bratislave	18	98
3	EU BA, Ekonomická univerzita v Bratislave	10	51
4	UMCS, Uniwersytet Marii Curie-Skłodowskiej w Lublinie	13	71
5	Sapienza, Sapienza Università di Roma	18	98
6	TUD, Technische Universität Dresden	15	81
7	Bifröst, Háskóllin á Bifröst	2	12
8	UvA, Universiteit van Amsterdam	3	14
9	Others (please specify)	5	27
	Total	**100**	**536**

The report encompassed responses from 536 students (Mean age = 23.38; SD age = 5.85; female = 55.22%) across several European countries, including Portugal, Slovakia, Poland, Italy, Germany, Iceland, and the Netherlands.

The academic level of the respondents was predominantly undergraduate, accounting for 67.91% of the total. Postgraduate students, including those pursuing master's degrees, comprised 22.20%, while doctoral students constituted 6.72%. The remaining percentage fell into other categories. Regarding university affiliation, the distribution was as in the table above.

Section 3: Evaluation of Selected Close-ended Questions

Firstly, when categorized under the STEAM acronym (Science, Technology, Engineering, Arts, and Mathematics), the results indicated that the participants successfully and accurately classified their areas of study into the respective STEAM categories. Arts was the most common category, accounting for 51.97% of responses. This aligns with the students' self-reported majors, primarily in Social Sciences, Business and Management, Law, Humanities, and Arts, along with specialized fields such as Icelandic Language and Culture, Women's Rights, and Tourism Management. Students' classification of diverse subjects under Arts indicates a broad interpretation of STEAM, extending beyond visual and performing arts to societal, cultural, and linguistic fields. This reflects a view of the arts as fostering critical thinking, creativity, and a humanistic perspective, essential in fields like psychology, management, and architecture.

This distribution also possibly indicates a broader interpretation of what constitutes Arts in the contemporary academic landscape.

The results offer insight into students' perceptions of of creative thinking. Students prioritized *idea generation, creation,* and *problem-solving* over simply *asking questions*, reflecting their recognition of creativity's practical applications. In today's rapidly changing

world, the ability to not just question but also to innovate and implement solutions is highly valued. This shift aligns with the growing emphasis on project-based learning and real-world applications, reinforcing creativity as a tool for innovation and problem-solving as shown in Figure 20.

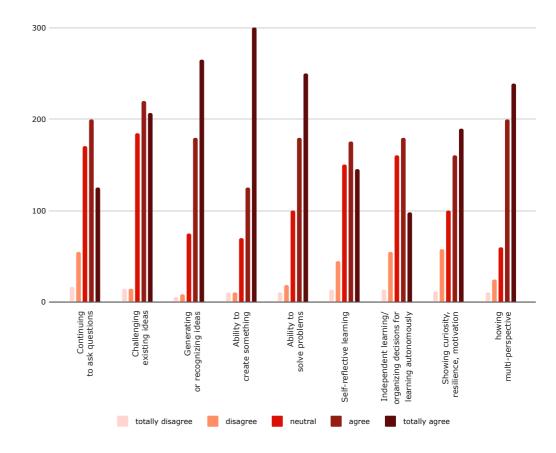*Fig. 20: HEI Students: Students' perception on various aspects of creative thinking*

Our results show that students develop creative thinking in various settings, though their effectiveness varies. Extra-curricular activities and scientific projects are the most effective in enhancing creative thinking. In contrast, regular classes and specialized courses had mixed results, reflecting the need for more dynamic, student-centred

approaches to foster creativity. Not all training opportunities are equally accessible or effective. Differences in quality and availability can result in uneven development of creative thinking skills.
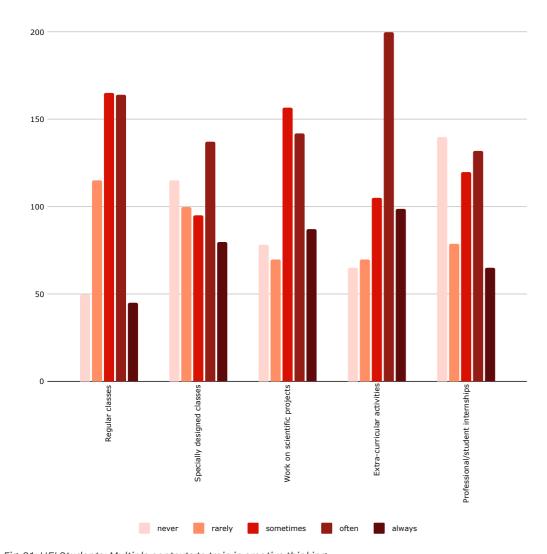
Fig. 21: HEI Students: Multiple contexts to train in creative thinking

Students viewed the influence of external stakeholders as largely positive across different areas of university life. This perception stems from the practical experience, diverse perspectives, and opportunities provided by external stakeholders. These benefits are particularly evident in areas directly impacting student experiences like internships, career opportunities, and innovative activities. Students perceived less external influence in areas like HEI staff promotions and council meetings, likely because these are internal university matters.

Fig. 22: HEI Students: Influence of external stakeholders

Students identified a number of organizational barriers to collaborating with external stakeholders. Furthermore, students also cited time constraints and lack of information as the biggest barriers to external collaboration.
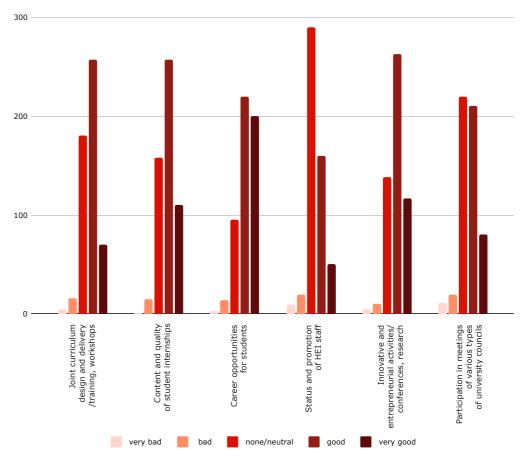
Students cited time constraints and lack of information as the most significant barriers to external collaboration. Students struggled to balance their academics, personal commitments, and external cooperation opportunities. Poor communication about such opportunities and limited practical training in their curriculum further restrict their engagement with external stakeholders.
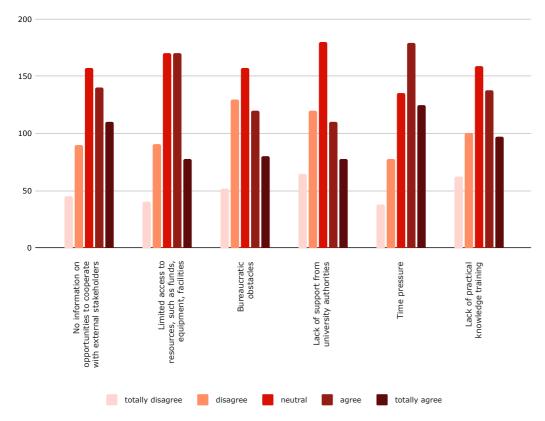

Fig. 23: HEI Students: Barriers to participating in activities involving cooperation with external stakeholders

Section 4: Evaluation of Selected Open-ended Questions

In response to the open-ended question about external stakeholders, students reported diverse interactions with various external entities. Most students reported brief interactions with stakeholders, typically through one-off events like training sessions or study visits. Notably mentioned stakeholders included commercial design studios, the City of Bratislava, libraries and archives, and various educational institutions such as elementary, middle, and high schools. A smaller group of students maintained long-term collaborations, particularly with art spaces, university groups, and their former schools, highlighting a more sustained level of engagement. While less common, these ongoing collaborations fostereddeeper, more meaningful relationships.

Collaborations on time-limited projects were another significant category of responses, where students engaged with school systems for internships, student organizations in biotechnology, and specific professionals, for example, in law firms. These projects offer valuable practical experience and networking opportunities, which could enhance their learning and future employment prospects. The involvement of students in webinars and specific events related to their degrees like computer engineering and participation in programs like the Blended Intensive Program (BIP Erasmus+) showcase the variety of platforms through which students engage with stakeholders outside the university setting.

Overall, the student responses underline the importance of external stakeholder engagement in enriching the educational experience, with most interactions occurring as single instances. However, some have developed into continuous relationships or collaborations on projects that align with their academic and professional interests.

As for the open-ended question, *What other external stakeholders would you like to have more frequent contact with in the future (if any)?*, the university student sample displayed diverse preferences. Notably, many students were interested in increasing future

contacts with entities that align with their academic and professional interests. Specific stakeholders mentioned including companies related to their field of study, broadcasting systems, international institutions, local initiatives, and various entities from the fields of art and technology. Stakeholders of high interest were multinational companies, marketing and publicity companies, CEOs, and entities involved in the music, events, and art industries.

The desire to engage more with institutions from abroad also featured prominently, indicating an interest in broadening personal and professional networks. A number of students strongly preferred more engagement with notable organizations such as NGOs, European Union institutions, and specific professional domains like HR managers and soft skills teachers.

The range of answers showcases a student body eager to integrate practical experiences and networking opportunities into their academic lives, with an apparent inclination towards stakeholders that provide direct value to their educational and career growth. The data reflects a strategic perspective where students actively seek collaborative interactions that could bolster their professional development.

Section 5: Summary of HEI Students Survey Responses

In summary, the responses from university students provide a nuanced picture of their engagement with external stakeholders and the perceived influence on their creative education. Students adeptly navigated the STEAM framework, often categorizing their fields of study within an inclusive interpretation of "Arts".

They have placed substantial value on the practical application of creativity in problem-solving and idea generation, aligning with a pedagogical shift towards project-based learning that meets the evolving demands of the workforce.

The responses indicate that, while various opportunities to foster creative thinking exist. Although their effectiveness varies, extracurricular activities and scientific projects are considered particularly impactful. Conclusively, the students' responses reflect a sophisticated and tactical approach to integrating creative and academic learning, emphasizing the importance of external partnerships that contribute positively to their educational journey. Students acknowledge the positive influence of external stakeholders on various facets of university life, particularly in enhancing practical experiences and career opportunities. However, they also call for a balanced synergy between academic pursuits and stakeholder collaborations to ensure the enrichment of their educational goals without compromising the essence of academic learning.

The insights from these survey results reveal a generation of students who are not only equipped to transition into the professional world but also intent on shaping their environments so that creativity and innovation figure prominently in a rapidly changing global landscape.

Finally, three key insights from HEI Students Survey follow. Further elaboration of key insights will be provided in the Conclusion chapter of the publication.

- Regarding creative thinking, students prioritized idea generation, creation, and problem-solving, recognizing their practical applications over mere question-asking.
- Regarding the contexts in which students have had the opportunity to train in creative thinking, they perceive extra-curricular activities and scientific projects as more effective. In contrast, regular classes and specially designed courses are seen as less beneficial.
- Students generally perceive the influence of external stakeholders as positive across various areas of their university. They particularly value the practical experience, diverse perspectives, and additional opportunities they provide, especially in enhancing internships, career opportunities, and innovative activities.

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Conclusion

The data collection and summaries in preceding chapters have provided insights and a complex outlook for specific HEI target groups—students, teachers, managers, and partners—on the challenges, benefits, and expectations of mutual cooperation between HEIs and external stakeholders. Besides the concluding remarks and interpretation of the survey responses for each chapter, the authors of these chapters were asked to offer three critical, *key insights* of their survey. Some of the key insights have a more general nature whereas others provide a specific number or percentage that can be measured. The insights represent the most pertinent survey results.

Then, a *Learning, Teaching, and Training (LTT)* event followed. An LTT event (a standard event for Erasmus+ projects) is usually a 3-day workshop. Our event was held in March 2024 in Bratislava and was organized by STU and EUBA. The survey research provided robust material for further expert discussion at the LTT event based on 12 critical insights.

At the LTT event, teachers, educators, and program stewards from the eight universities of the consortium tuned their understandings and built upon these insights during a series of workshops, using design thinking tools and strategies. The experts first rallied around the CT.uni project goal and mission, then worked on codifying the innovation in teaching and learning primarily by empathizing with specific target groups. About 20 participants were divided into four groups to role-play and empathize with HEI partners, managers, students, and teachers.

The task for this group of experts was to provide a qualitative review of quantitative data from the questionnaires. As said, 12 key insights served as a foundation for group work and discussion. The general question that has been guiding the whole process was the following: *How do we measure the criteria of a successful cooperation? What are the challenges resulting from the key insights?* The guiding research hypothesis, that creative thinking is fostered and innovation is more likely to occur when HEIs cooperate with external stakeholders, was thoroughly examined from diverse perspectives.

Each expert group worked with three specific key insights defined for specific target group. The task of each group was to brainstorm and select quantitative and measurable *criteria for successful cooperation* between HEIs and external stakeholders, and finally to choose the three most relevant ones.

The outputs of the LTT event resulted in a *set of recommendations* (criteria) to be followed/ fulfilled when preparing for successful cooperation that leads to innovative and creative thinking.

On the following pages and in the following tables, you will find the results of the expert groups elaborating the HEI partners', managers', teachers', and students' key insights during the Learning, Teaching, and Training event.

Reflecting a single key insight, the main tasks of the groups were:

- to name a criterion (*How can we help? What should be done to improve the current state?*),
- to communicate its ideal condition (*Ideally, where do we want to go?*),
- to explain why the specific criterion is important.

1. Key Insights from the HEI Partners Results

The following statements, derived from quantitative feedback obtained through questionnaires and in-depth interviews with representatives of the HEI Partners (June through November 2023), hold significant weight in our research.

- 63% of external partners evaluated time as a big or very big barrier when naming the biggest barriers to maximizing the benefits of cooperation for both parties;

- 50% of respondents consider the quality of transdisciplinarity and usability in the practice of students' outcomes only as average, whereas only 19% consider them excellent quality.

- Students have problems with time management, where 50% of respondents see it as average or poor.

The following table provides the results of the LTT expert group simulating the role of HEI Partners after having discussed these key insights.

Table 2: A set of criteria for a successful cooperation between HEIs and external stakeholders derived from key insights from the results of the HEI Partners questionnaire. Elaborated by the group of experts simulating HEI Partners at the CT.uni Erasmus+ LTT event in March 2024.

	CRITERIA	IDEAL CONDITION	WHY
1	Partners interested in participation in international competitions	Partners are engaged in society. They want to build authentic and truthful PR in their corporate social responsibilities. They are interested in showcasing their work. Cooperation with HEIs totally supports their values.	Motivation and Engagement: Competing in challenging events can motivate students to push their boundaries and set higher goals. Skills Development: Competitions allow students to apply and enhance their academic knowledge and practical skills in a competitive setting. Networking: Competitions often attract participants from various universities, industries, and organizations, offering students valuable networking opportunities to connect with peers, professionals, and potential employers. Practical Experience: Competitions immerse students in real-world challenges and problems, offering them the opportunity to gain practical experience in problem-solving, critical thinking, and innovation.
2	Implementation of a project management software	The project has SMART (specific, measured, approved, realistic, time-framed) goals that the team is aware of, along with the critical project deadlines and milestones.	The PM software assists in allocating resources efficiently, setting realistic timelines, and tracking progress to ensure timely completion of tasks by students, teachers, and partners.
3	Get a qualified, determined, and tested new employee/ coworker.	Students are offered a joint bachelor/diploma thesis with an external stakeholder.	Partners can (ideally) choose from various students and pick those they need/prefer based on previous, objective, hands-on experience.

2. Key Insights from the HEI Managers Results

The following statements resulted from the output of the HEI Managers questionnaires and are based on interviews with the HEI Managers (June through November 2023).

- Aside from being pressed for time, university managers identify a lack of flexibility in setting up and implementing partnerships with external organizations. The academic calendar typically allows for very little flexibility if problem-based challenges are to be solved within specific areas of study.

- A model for good cooperation could be a scenario where an external stakeholder suggests a challenge and can provide timely, first-hand access to data and experts who will dedicate time for students to interview them. With relatively low stakes, a partner may be open to supporting a creative and novel approach to problem-solving, giving students a chance to think creatively and to explore and generate ideas actively.

- For the university, gaining access to such challenges enriches their students' experience, adds relevance and variety to courses, and contributes to the university's societal impact.

The following table provides the results of the expert group (representing HEI Managers) elaborating on the HEI Managers' critical insights during the Learning and Teaching Training event.

Table 3: A set of criteria for successful cooperation between HEIs and external stakeholders derived from key insights from the results of the HEI Managers questionnaire. Elaborated by the group of experts simulating HEI Managers at the CT.uni Erasmus+ LTT event in March 2024.

	CRITERIA	IDEAL CONDITION	WHY
1	Satisfying number of excellent external organizations to cooperate with	Organization of open-days at HEI: looking for enterprises based on "dating", match-making – naming mutual goals and expectations of such cooperation in order to: • have a list of teachers willing to join such cooperation • have a list of external organizations willing to join such cooperation	Managers need to have a virtual structure for specific topics, connected to big challenges. Managers need to communicate the impact, to have an authentic PR and message: We want to be (and are) part of the society!
2	Easy and smooth synchronization of teaching/learning schedule: time (management) runs differently at HEIs and external stakeholders	Matching the didactics with the needs of business: engaging students in a cooperation should be beneficial also for teachers. Students get ECTS, the cooperation with external stakeholders should be compulsory (at some point, at a certain course).	The cooperation with external stakeholders enables real experience, it adds relevance to the internship and makes it part of studies.
3	Motivation for teachers: they have no direct benefit when working with external stakeholders.	HEI Managers need teachers and researchers, who want to impact society. They are open minded, actively seeking for opportunities, they propose themselves for a collaboration.	Teachers and researchers can get access to more chances to work with enterprises, they can acquire more money for their research.

3. Key Insights from the HEI Teachers Results

The following statements resulted from the HEI Teachers questionnaires and are based on anonymous responses from HEI Teachers (June through November 2023).

- One-third of the teachers reported being unfamiliar with teaching strategies for using creativity in the classroom, indicating the need for innovative teacher training in creativity.

- Among the strategies for enhancing students' creativity, most teachers agree that challenging students to collaborate by evaluating new ideas, promoting innovative learning activities, dedicating time to develop empathy within groups, and including short activities to practice creative thinking and resilience are among the most promising activities to boost students' creativity.

- Teachers understand that collaboration with external stakeholders is essential to enhance and develop creative thinking in the classroom. Government institutions, local authorities, and non-governmental organizations are important stakeholders that should be integrated into the classroom to develop projects and use creative thinking.

The following table provides the results of the expert group (representing HEI Teachers) elaborating on the HEI Teachers' key insights during the Learning and Teaching Training event.

Table 4: A set of criteria for a successful cooperation between HEIs and external stakeholders derived from key insights from the results of the HEI Teachers questionnaire. Elaborated by the group of experts simulating HEI Teachers at the CT.uni Erasmus+ LTT event in March 2024.

	CRITERIA	IDEAL CONDITION	WHY
1	Regulation of stakeholders engagement	Clear procedures and capacity for engagement of external stakeholders to the teaching process. Everybody knows what to do and when.	Restate/Reword balanced partnership agreement for the specific collaboration. It will lead to better use of resources (people, time, finances).
2	Supportive teaching program	Ongoing mentoring program for teaching innovation. Teachers need the support and the university management has to provide it to them.	The quality of teaching will be improved by implementing methods that support creative thinking.
3	Collaborative activities	Thematic meeting to focus on diverse activities	Teacher team working recognition, so they get to know each other.

4. Key Insights from the HEI Students Results

The following statements resulted from the HEI Students questionnaires and are based on the anonymous responses of HEI Students (June through November 2023).

- Regarding creative thinking, students prioritized idea generation, creation, and problem-solving, recognizing their practical applications over mere question-asking.

- Regarding the contexts in which students have had the opportunity to train in creative thinking, they perceive extra-curricular activities and scientific projects as more effective than regular classes and specially designed courses.

- Students generally perceive the influence of external stakeholders as positive across various areas of their university. They particularly value the practical experience, diverse perspectives, and additional opportunities they provide, especially in enhancing internships, career opportunities, and innovative activities.

The following table provides the results of the expert group (representing HEI Students) elaborating on the HEI Students' critical insights during the Learning and Teaching Training event.

Table 5: A set of criteria for a successful cooperation between HEIs and external stakeholders derived from key insights from the results of the HEI Students questionnaire. Elaborated by the group of experts simulating HEI Students at the CT.uni Erasmus+ LTT event in March 2024.

	CRITERIA	IDEAL CONDITION	WHY
1	Communication strategy by Department or Faculty	All students are motivated and engaged, and they are informed about all possible ways of their involvement in extracurricular and/or research activities.	To be transparent, to give equal access to all students, to attract students, to show them the benefits of extracurricular activities, and to structure the measurement of the outcome.
2	Creation of guidelines for co-operation with external partners	It is smooth and transparent co-operation, where students, as well as partners and the university, are satisfied without threads to the reputation of the university according to ESG (Environmental, Social and Governance aspects/ values of a company).	The aim is to avoid risks of damaging cooperation, with the aim of finding win-win solutions, facilitating communication, and helping the decision-making process.
3	Toolbox for teachers	Everybody uses this toolbox to make their teaching process attractive and practical, and students are happy and create excellent projects.	It might help teachers save time by eliminating the need to search the Internet or books for information.

Final Word

At the core of this project, we aim to synergize academic theories with the practical realm, highlighting the potential positive influence of external collaborations on the creative and intellectual development recognized. Our research efforts recognize and identify the key ingredients for successful collaboration with external stakeholders to codify innovation in education and teaching, leading to an increased understanding of how knowledge is created and can be stimulated through innovation-focused approaches to learning and teaching. These results should also help to determine how challenges from different stakeholders can be identified, codified, and used by academics to support the student experience.

By gathering the inputs from HEI partners, managers, teachers, and students, sharing their experiences, interpreting the questionnaire results, and determining a set of recommendations/criteria, we have offered the findings and insights summarized in this publication to test the transferability potential in other higher educational institutions. We hope to nudge and encourage other HEIs to enter readily into cooperation with external stakeholders. The experience is always precious.

What works?
What does not work?
Is your institution ready to cooperate with external stakeholders?

The set of recommendations/criteria will help to verify the readiness of your HEI for the cooperation with external stakeholders.

COMBINED CRITERIA FOR PARTNERS—MANAGERS—TEACHERS—STUDENTS

	CRITERIA	IDEAL CONDITION	WHY
1	Partners interested in participation in international competitions	Partners are engaged in society. They want to build authentic and truthful PR in their corporate social responsibilities. They are interested in showcasing their work. Cooperation with HEIs totally supports their values.	Motivation and Engagement Skills Development Networking Practical Experience
2	An implementation of a project management software	The project has SMART (specific, measured, approved, realistic, time-framed) goals that the team is aware of, along with the critical project deadlines and milestones.	The PM software assists in allocating resources efficiently, setting realistic timelines, and tracking progress to ensure timely completion of tasks by students, teachers, and partners.
3	Get a qualified, determined, and tested new employee/coworker.	Students are offered a joint bachelor/diploma thesis with an external stakeholder.	Partners can (ideally) choose from various students and pick those they need/prefer based on previous, objective, hands-on experience.
1	Satisfying number of excellent external organizations to cooperate with	Organization of open days at HEI: looking for enterprises based on "dating" and match-making – naming mutual goals and expectations of such cooperation.	Managers need a virtual structure for specific topics connected to big challenges. They also need to communicate the impact— to have an authentic PR and message: We want to be (and are) part of the society!
2	Easy and smooth synchronization of teaching/learning schedule: time (management) runs differently at HEIs and external stakeholders	Matching the didactics with the needs of business: Engaging students in a cooperation should be beneficial also for teachers. Students get ECTS, the cooperation with external stakeholders should be compulsory.	The cooperation with external stakeholders enables real experience; it adds relevance to the internship and makes it part of studies.
3	Motivation for teachers: They have no direct benefit when working with external stakeholders.	HEI Managers need teachers and researchers, who want to impact society. They are open-minded, actively seeking for opportunities, they propose themselves for a collaboration.	Teachers and researchers can get access to more chances to work with enterprises, they can acquire more money for their research.

	CRITERIA	IDEAL CONDITION	WHY
1	Regulation of stakeholders engagement	Clear procedures and capacity for engagement of external stakeholders to the teaching process. Everybody knows what to do and when.	Restate/Reword balanced partnership agreement for the specific collaboration. It will lead to better use of resources (people, time, finances).
2	Supportive teaching program	Ongoing mentoring program for teaching innovation. Teachers need the support and the university management has to provide it to them.	The quality of teaching will be improved by implementing methods that support creative thinking.
3	Collaborative activities	Thematic meeting to focus on diverse activities	Teacher team working recognition, so they get to know each other.
1	Communication strategy by Department or Faculty	All students are motivated and engaged, and they are informed about all possible ways of their involvement in extracurricular and/or research activities.	To be transparent, to give equal access to all students, to attract students, to show them the benefits of extracurricular activities, and to structure the measurement of the outcome.
2	Creation of guidelines for co-operation with external partners	It is smooth and transparent co-operation, where students, as well as partners and the university, are satisfied without threads to the reputation of the university according to ESG (Environmental, Social and Governance aspects/values of a company).	The aim is to avoid risks of damaging cooperation, with the aim of finding win-win solutions, facilitating communication, and helping the decision-making process.
3	Toolbox for teachers	Everybody uses this toolbox to make their teaching process attractive and practical, and students are happy and create excellent projects.	It might help teachers save time by eliminating the need to search the Internet or books for information.

Table 6: The combined sets of criteria for successful cooperation between HEIs and external stakeholders includes the CRITERIA – IDEAL CONDITION – WHY for all respective and examined target groups, March 2024.

Acknowledgement

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CREATIVITY SUCKS
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CT.uni: Creative Thinking—Taking an Innovative and STEAM Approach for a Transdisciplinary University

Codifying Innovation for Learning and Teaching focuses on profiling the challenges associated with creative thinking, interdisciplinarity, collaboration, and STEAM teaching principles. It includes methods and tools for gathering and assessing innovation challenges that arise when working with external stakeholders (partners). The data is based on research by a European consortium of universities and reflects data collection from students, teachers, university management, and partners who have been involved in university-industry collaborations. The publication aims to identify how the challenges of such collaborations can be identified, codified, and leveraged by academics to support student leadership.

The research involved quantitative and qualitative data collection through questionnaires at eight universities in the Netherlands, Germany, Italy, Iceland, Portugal, Slovakia, and Poland, which identified the advantages, disadvantages, challenges and benefits of such cooperation for innovation and the development of creative thinking. The inputs were then subjected to in-depth analysis by expert groups composed of educators, curriculum stewards, and education experts to compile criteria for successful collaboration.

As a result, a series of recommended criteria, to be considered as a prerequisite for successful collaboration between higher education institutions and partners from industry, has been identified.