Challenge-based Learning and co-innovation between students and companies

Future concepts for modernizing higher education and strengthening the regional innovation capacity

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Foreword

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This White Paper presents the results and recommendations for action of the future discourse "Democratizing Innovation" funded by the Ministry of Science and Culture of the State of Lower Saxony (MWK), Germany. It focuses on two future concepts that can be seen as important levers for modernizing teaching in higher education and strengthening the regional innovation capacity: Firstly, the new teaching and learning approach of Challenge-based Learning (CBL), which has been developed since the early 2000s and has been increasingly used in university teaching over the past ten years. Secondly, collaborative innovation projects between students and companies, which are rapidly gaining in importance as a new form of "open innovation" and "co-innovation". The future discourse and the White Paper thus bring together two central perspectives on the role of universities that have so far been largely treated separately in theory and practice: the perspective on teaching in higher education and the transfer as well as innovation perspective. The integrative consideration of new learning and innovation formats at the interface of the education and innovation system opens up new opportunities that can contribute to the modernization of higher education institutions and by strengthening the innovation capacity of Lower Saxony, but also of Europe as a whole.

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1 Modernizing higher education and innovation systems

The future discourse „**Democratizing Innovation**" (see box on p. 5), funded by the Ministry of Science and Culture of the State of Lower Saxony, Germany, refers to the major challenges such as climate change, the transformation of the energy system and the modernization of the higher education system. It also takes up the vision formulated by the state government in the „Lower Saxony Regional Innovation Strategy for Intelligent Specialization (RIS3)": „Innovation in and from Lower Saxony generate socially balanced and resource-efficient value creation and make an important contribution to overcoming regional and global challenges."[1]

Overcoming **the major challenges of the future** (Grand Challenges) requires the acceleration of transformation processes. The initiation, development and implementation of technical and social innovations are central to this. This can only succeed with efficient national and regional innovation and higher education systems. The report „The future of European competitiveness", mandated by the European Commission and authored by the former Italian Prime Minister and President of the European Central Bank, Mario Draghi,[2] highlights the importance of these systems for Europe's future and competitiveness. He calls for closing the innovation and skills gap that has been identified as quickly as possible.[3] The modernization of higher education institutions, the increase in innovation capacity through new innovation actors (innovators, change makers) and the realization of new types of cooperation at the interface between the education and innovation system are a key element in this.

Giving not just a few, but many people an active role as innovators or change agents in the innovation process is the fundamental idea behind the idea of democratizing innovation. Hence, the correspondent future discourse focuses on **joint innovation projects** between students and companies and the teaching and learning approach of Challenge-based Learning practiced in this context. In a recent study by the Stifterverband für die Deutsche Wissenschaft, this is classified as an **„innovative future concept for higher education"** with „high impact in the tertiary education system of Germany".[4] The discourse on the future thus takes up the demand for the modernization of higher education institutions and the strengthening of Europe's innovation capacity. The EU-funded higher education initiative of the European Institute of Innovation and Technology (EIT)[5] shows how these can be tackled in an integrated manner.

The education of „change makers" and joint innovation projects between students and companies are the focus of the future discourse on „Democratizing Innovation". Cooperative innovation processes (co-innovation) at the interface between the education and innovation systems are made possible by the practice-oriented approach of Challenge-based Learning.

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1 Lower Saxony Ministry for Federal and European Affairs and Regional Development (2020, p. 43).
2 Draghi (2024).
3 See Draghi (2024, p. 19 ff. and 32 ff.).

4 Donors' Association for the Promotion of Sciences and Humanities in Germany (2024). p. 44.
5 See https://eit-hei.eu/ (last accessed on 20.11.2024).

The future discourse on "Democratizing Innovation"

The future discourse „Democratizing Innovation" (duration: October 2023 to December 2024) focused on the question of how additional regional innovation potential can be unlocked and what framework conditions must be established in order that joint innovation projects between students and companies can contribute to regional innovation capacity and to solving sustainability challenges as a new form of „co-innovation". The project was funded by the Ministry of Science and Culture of the State of Lower Saxony (MWK), Germany, as part of the call for proposals „Discourses on the Future"[6]. The discourse on the future builds on knowledge gained by the team of the adjunct Chair of Innovation Management and Sustainability at the Carl von Ossietzky University of Oldenburg in the EU-funded projects „Scaleup4Sustainability"[7] and „Challenge4Impact"[8] in previous years.

In order to systematically engage stakeholders in the regional innovation system and in co-innovation processes between universities and companies in an active, inspiring and constructive dialog, various discourse formats were organized. The kick-off event took place at the beginning of March 2024, at which the importance of students as new innovation actors in the co-innovation process with companies was discussed.

Building on the kick-off event, videos were produced and shared on social media [9] to raise awareness of the teaching-learning concept of Challenge-based Learning and knowledge transfer about potential co-innovation processes. A total of fifteen interviews were conducted with experts from Lower Saxony's education and innovation system between June and September 2024 in order to ponder design and implementation options for perpetuating co-innovation processes.

Preliminary results were discussed at an online workshop with representatives from companies, associations, transfer institutions and university lecturers. As a best practice approach, Professor Dr. Bram Kuijken from the University of Amsterdam presented the „Master Challenge" platform[10] developed by him, which provides various services for teachers and other participants in Challenge-based Learning approaches across all locations in the Netherlands. The final event of the future discourse at the end of November 2024 focused on hypotheses on the professionalization, dissemination and perpetuation of co-innovation processes between students and companies. The extensive experiences of the participants and their comments and recommendations as well as the findings of the entire future discourse have been incorporated into this concept paper.

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6 See https://zukunft.niedersachsen.de/foerderangebot/zukunftsdiskurse/ (last accessed: 06.12.2024)

7 See https://uol.de/innovation/forschung/scaleup4sustainability (last accessed on 10.12.2024)

8 See https://uol.de/innovation/forschung/challenge4impact (last accessed on 10.12.2024)

9 See https://uol.de/innovation/forschung/demokratisierung-von-innovation/newsletter-zukunftsdiskurs-demokratisierung-von-innovation/veranstaltung/online-diskurs (last accessed: 06.12.2024)

10 See https://masterchallenge.me/ (last accessed: 6.12.2024)

2 Challenge-based Learning and co-innovation on the rise

> Challenge-based Learning (CBL) is a new teaching and learning approach in which students develop innovative solutions to real-world challenges together with practice partners. The learning and cooperation process aims to find a collaborative developed solution that is ecologically, socially and economically sustainable.

Challenge-based Learning (CBL) is a new teaching and learning approach that has been developed since the early 2000s and has been increasingly used in higher education teaching over the past ten years. CBL is classified as an **„innovative future concept for higher education"** with a „high impact on the German tertiary education system".[11] The approach promotes the **acquisition of key competencies and „future skills",** students' knowledge of major future challenges (e.g. climate change) and cooperation with stakeholders from business and society. CBL takes up well-known approaches of active, experience-based and collaborative learning and focuses on **real-world** challenges and

problems.[12] Learning takes place by identifying, analyzing and developing a solution to a specific problem. The learning experience is usually multi-disciplinary and aims to find a collaborative developed solution that is environmentally, socially and economically sustainable.[13]

The challenges typically refer to the major future and transformation challenges, such as those articulated in the United Nations' 17 Sustainable Development Goals. Challenge-based Learning thus includes elements of problem- and project-based learning but differs from these older teaching/learning approaches by involving collaboration with practitioners and the processing of challenges, which are usually introduced by them and making the external partners to **challenge providers.** The latter ensures practical relevance and sector expertise. The role for higher education teachers differs from traditional lecturing. They organize, moderate and coach the learning and cooperation process and ensure the provision of methodological and process knowledge „on demand".[14]

The Challenge-based Learning process consists of three **phases**: In the „Engage" phase, the economic or societal need is analyzed, and corresponding challenges are formulated. In the „Investigate" phase, possible solutions to the challenge are then developed and tested. Finally, in the „Act" phase, selected solutions are operationalized and, if possible, implemented by the practice partner („challenge provider").
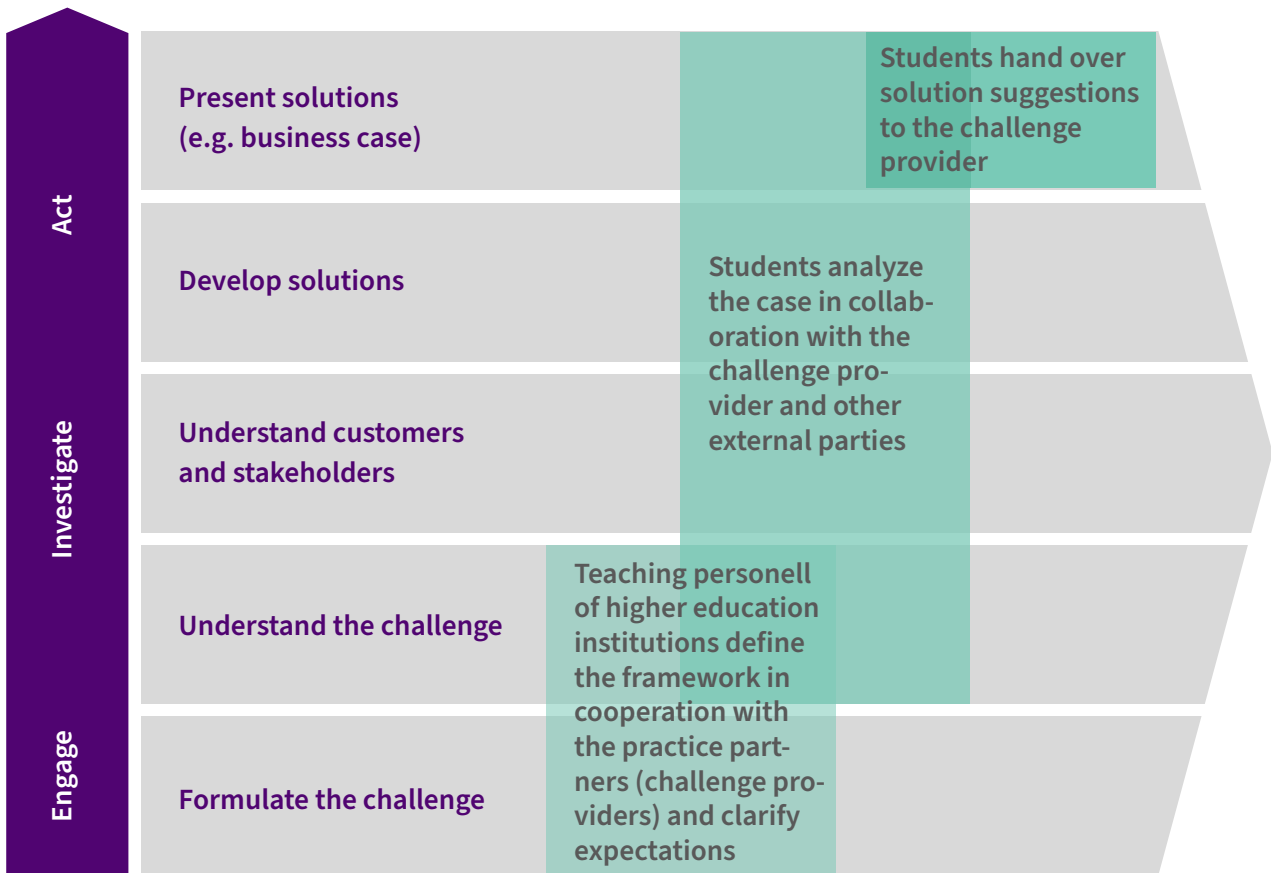

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11 Donors' Association for the Promotion of Sciences and Humanities in Germany (2024). p. 44.
12 Gallagher & Savage (2020).
13 Malmqvist, Kohn Radberg & Lundqvist (2015, p. 4).
14 Eldebo & Hjelm (2024, p. 13 f.)

Figure 1: Phases of the Challenge-based Learning process

Act / Investigate / Engage			
Act	**Present solutions (e.g. business case)**		Students hand over solution suggestions to the challenge provider
	Develop solutions	Students analyze the case in collaboration with the challenge provider and other external parties	
Investigate	**Understand customers and stakeholders**		
	Understand the challenge	Teaching personell of higher education institutions define the framework in cooperation with the practice partners (challenge providers) and clarify expectations	
Engage	**Formulate the challenge**		

Source: Eldebo & Hjelm (2024, S. 8) with minor adaptations by the authors.

> „Co-innovation" refers to innovation processes in which partners work together across organizational boundaries to develop an innovative solution (technology, product, service, process, practices).

An important branch of Challenge-based Learning relates to collaborative innovation projects between students and companies. The external partners formulate specific problems and tasks from ongoing start-up or innovation projects. These can relate to new technologies, products, services or processes. This version of CBL can therefore also be characterized as **„Innovation-based Learning"** and as a form of „open innovation". Students and external partners work together as equals in the cooperative innovation process (co-innovation) under the supervision and coaching of lecturers.

The collaboration, which is usually integrated into teaching programs, typically runs for one semester and therefore represents a kind of **„innovation sprint".** The University of Oldenburg is one of the pioneers in the development and implementation of Innovation-based Learning. Since 2009, the Chair of Innovation Management and Sustainability and the endowed Professorship of Entrepreneurship have offered the **„Sustainable Venturing"** module, in which students work with companies and start-ups to develop innovative sustainability-oriented solutions in six-month innovation sprints. One example of this is the innovation sprint with the start-up eco:fibr (see box).

The start-up eco:fibr as external partner and challenge provider

In the winter semester 2021/2022, the start-up eco:fibr was external partner and thus a „challenge provider" in the „Sustainable Venturing" module at the University of Oldenburg. The founding team has developed a process that uses previously unused waste products from pineapple cultivation. Pulp can be obtained from the fibers and leaves, which can be used by the paper industry, for example. Importing the pineapple leaves and processing them here in Germany would be neither economic nor ecological meaningful. Therefore, the task was to develop a business model in which the farmers could produce and sell the pulp themselves. The challenge was articulated as: „How could licensing the production process be integrated into eco:fibr's business model in the long term?" The students contacted growers in Latin America and conducted interviews. Various licensing models were examined with legal experts. The result is a licensing strategy that eco:fibr can now use to enable pineapple farmers to recycle waste material and offer the paper industry a sustainable alternative to conventional wood pulp.

© eco:fibr GmbH

Figure 2: Representation of the eco:fibr GmbH business model

pineapple plantation   pulp production   Paper industry

Costa Rica   Europe & USA
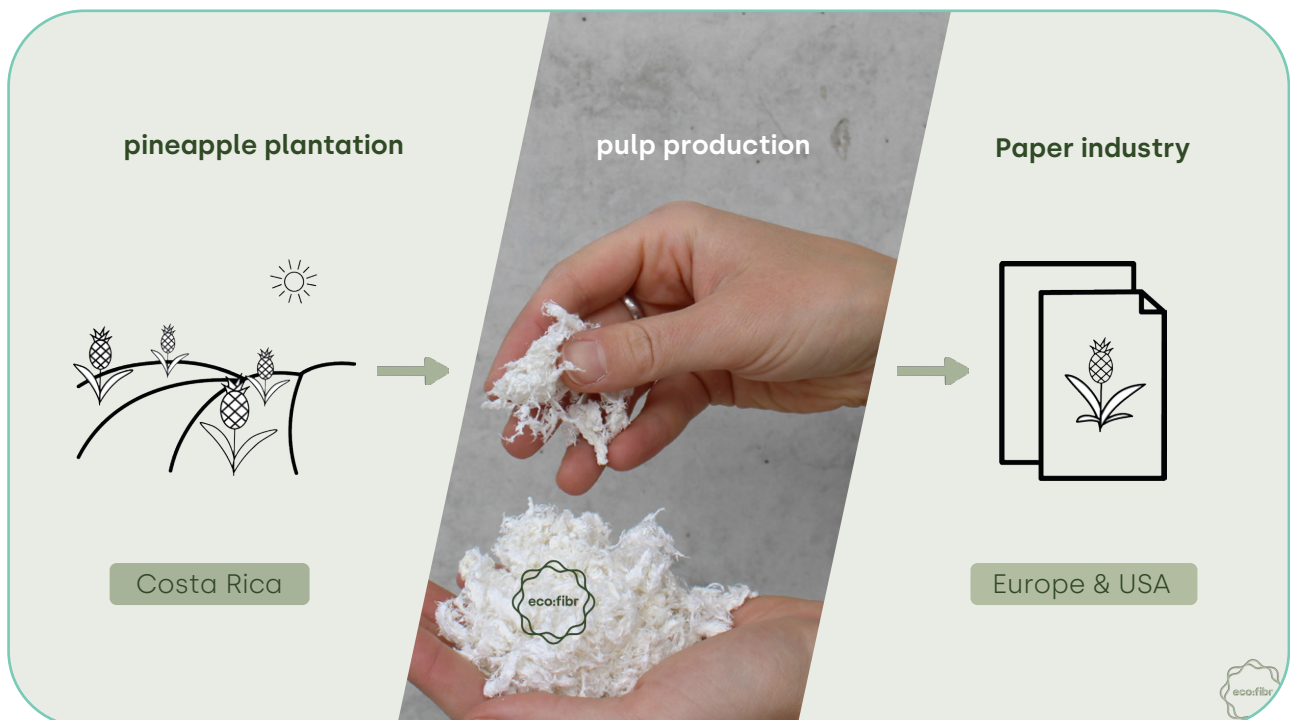
Source: eco:fibr GmbH (2021).

3 Benefits and the growing need for Challenge-based Learning and co-innovation

The evaluation of academic papers and practical literature carried out as part of the future discourse, as well as the dialogues and interviews conducted with experts from the fields of higher education and innovation activities, higher education teaching, transfer and business associations and companies show a growing interest in and a need for Challenge-based Learning (CBL) and cooperative innovation projects between students and companies. Indications of this include growing relevant networks such as the ECIU community[15], the number of universities developing corresponding offers and the increasing number of professional support services within the university, but also from professional service providers outside the university.[16] The analysis also shows numerous advantages for the various stakeholders involved in Challenge-based Learning and co-innovation projects between students and companies. These are listed in Table 1.

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15 See https://www.eciu.eu (last accessed 13.11.2024).
16 See Widrat & Fichter (2023).

Table 1: Advantages of Challenge-based Learning and co-innovation

Higher education	• Allows teaching transversal competencies and future skills in a particularly effective way • Allows application of theoretical knowledge and activates ideas and creativity of students • Promotes students' ability to organize themselves and teamwork skills • Teaches innovation and transformation skills and trains „change makers" • Students can gain realistic practical experience through the challenges and cooperation • Stimulates teaching innovation and curriculum development • Allows the university to raise its profile through an innovative „third pillar" of teaching • Increases the attractiveness of the university for future students

Table 1: Advantages of Challenge-based Learning and co-innovation

Students

- Positive feedback from students: „Enrichment for the studies"
- Very good addition to theory: „break out of the rather theory-heavy studies"
- Allows deep insights into practice and makes it possible to gain relevant practical experience
- Provides very good contacts to business and the reality of work
- Allows largely self-directed learning process and assumption of personal responsibility
- Coaching and provision of process and methodological knowledge by teachers „on demand"
- „Fun" and „meaningful"
- Combines an interesting learning approach and the „collection of credit points" (ECTS)

Transfer

- CBL and co-innovation projects help to establish and maintain contacts with external partners
- Increases the visibility of transfer offices and university start-up/innovation centers among students
- Contributes to raising students' awareness of start-ups (entrepreneurship education)
- Represents an effective form of start-up and innovation qualification for students
- Allows the participation of e.g. government-funded start-up teams as external partners
- Student teams' work helps founders develop business concepts
- Allows new knowledge exchange formats at the interface between teaching and transfer
- Increases the visibility of the university and raises its profile in business and society

Table 1: Advantages of Challenge-based Learning and co-innovation

Business partner

- Brings „fresh new perspectives from outside" and stimulates innovative ideas
- Helps to overcome „operational blindness"
- Ideas and work performance of student teams increase innovation capacity
- Allows „innovation sprints" and achieve concrete progress in the start-up or innovation process
- The students' analyses, concepts and proposals accelerate innovation projects
- The knowledge contributed by students and teachers increases competitiveness
- The cooperation allows young talent to get to know each other and improves recruiting
- Collaboration with teachers promotes follow-up projects and further transfer cooperation

Region

- Improves networking with regional clusters, hubs and startup factories
- Supports transformation initiatives of municipalities, regions and federal states
- Enables joint development of solutions for the transformation with politicians, NGOs, business development, etc.
- Promotes cooperation between the university and the regional economy

Innovation systems

- Promotes and develops students as drivers of innovation and transformation
- Facilitates the embedding of universities as part of the regional innovation system
- Enables many stakeholders to be involved in the innovation process
- Contributes to the Democratizing Innovation

4 Challenge-based Learning as a new form of practice-oriented university teaching

The demand that teaching in higher education must not be limited to theories and textbook knowledge alone and must move out of the classroom and establish links to social and professional challenges is not new, neither for universities nor for universities of applied sciences. The „preparation for professional activities that require the application of scientific knowledge and methods or the ability to create and design innovative solutions"[17] is one of the central tasks of universities. Against this background, various forms of practical relevance of higher education teaching and learning have emerged in recent decades. These include, for instance, dual study programs, practice-related case studies, practical lectures as part of courses, internships, activities as working students, practice-related final theses, e.g. in cooperation with companies, or part-time continuing education courses as a form of lifelong learning.

The teaching and learning approach of Challenge-based Learning (CBL) can be classified as practice- and transfer-oriented teaching in higher education. To what extent does it differ from previous approaches and formats? What is new about it?

Various features and characteristics can be used for differentiation and identification. Five central features have been selected for characterization, which are shown in Table 2.

A key element of Challenge-based Learning is the strong reference to real-world challenges. As explained in Chapter 2, Challenge-based Learning involves not only understanding a defined practical challenge, but also developing a solution approach in close cooperation with the external partner. The solution is intended to support the external partner in the implementation of their start-up or innovation project and aims to be taken up and, if possible, be implemented. While many practice-based teaching and learning formats are aimed at getting to know and understand practice (e.g. case studies, practical presentations, internships), they do not serve to develop solutions for implementation. Challenge-based Learning also differs from many other practice-based formats in terms of the degree of cooperation. CBL is characterized by very close cooperation between students and external partners „being on a par". This is not typically the case with internships, student traineeships or practice-based theses. Another special feature of Challenge-based Learning is the fact that it involves trilateral cooperation between teachers, students and external partners. This is rarely the case with other practice-based teaching/learning formats. Since not only the university members (lecturers, students) contribute their academic knowledge into the collaboration, but also the external partner contributes its practical knowledge (e.g. know-how about market conditions, customer requirements, etc.), this is a transdisciplinary process in which academic and practical knowledge are systematically integrated. Another important distinguishing feature of Challenge-based Learning is that it is not an individual learning process (individual learning) or a group learning process of students, but a collaborative learning process with practitioners, which can be described as „community learning".

Figure 3 provides a structured overview of existing approaches to practice-based teaching and learning concepts. Using three of the five dimensions identified in Table 2 as examples, the matrix visualizes the different forms of practice-based

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17 See § 3 of the Lower Saxony Higher Education Act in the version valid since 01.01.2024.

Table 2: Features and characteristics of Challenge-based Learning (marked in green) to distinguish it from previous forms of practice-based teaching concepts

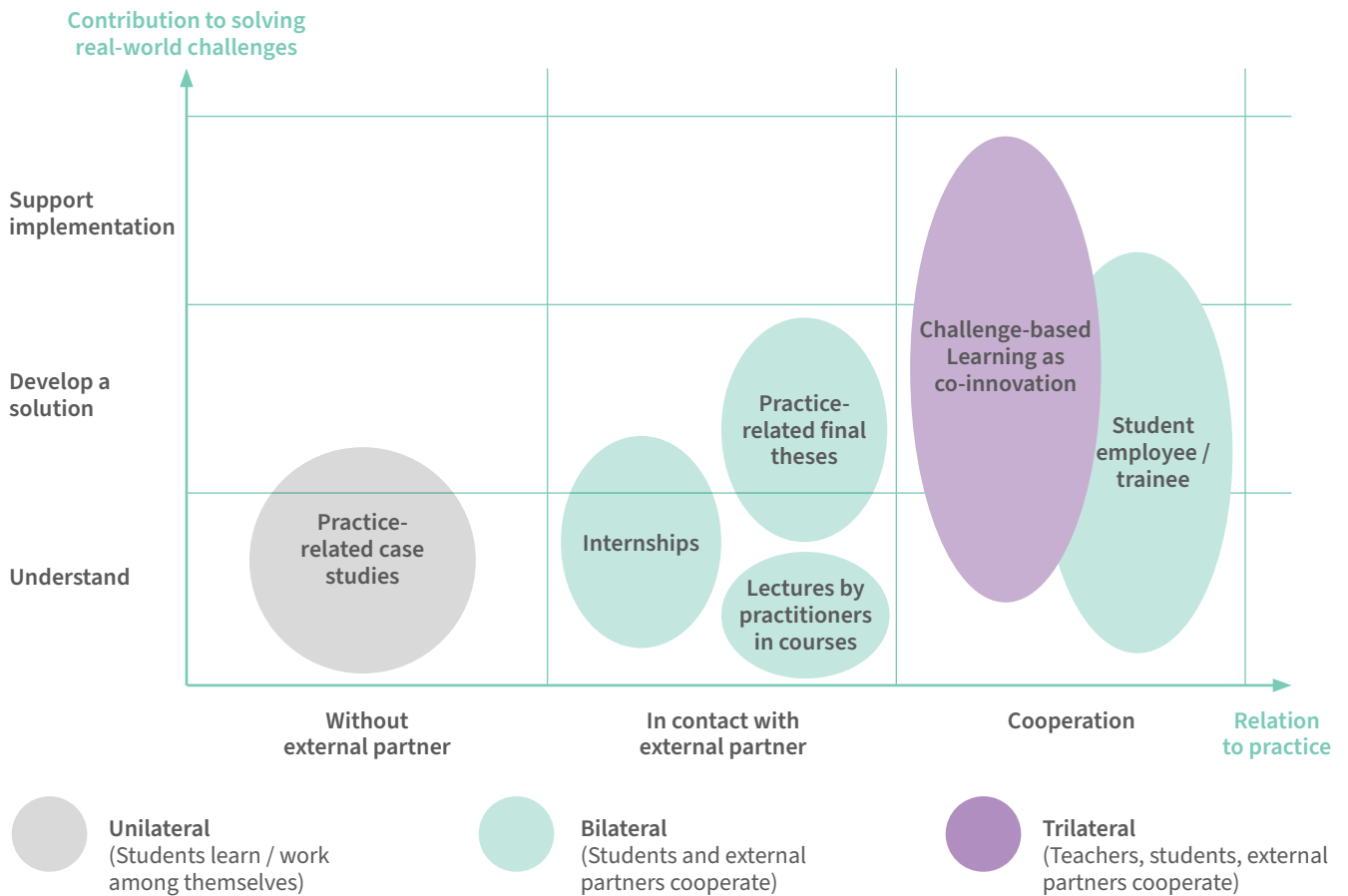| Feature	Characteristic		
Contribution to solving real-world challenges	Understand	Develop a solution	Support implementation
Relation to practice	Without external partner	In contact with external partner	Cooperation
Degree of cooperation between stakeholder groups	Unilateral (students learn / work among themselves)	Bilateral (Students and practice partners cooperate)	Trilateral (Teachers, students, external partners cooperate)
Disciplinary orientation	Disciplinary (one subject area)	Interdisciplinary (combination of several disciplines)	Transdisciplinary (integration of academic and practical knowledge)
Form of learning	Individual learning (one student)	Group learning (Several students)	Community learning (students, external partners, teachers)

Source: Own.

concepts. The vertical axis represents the three levels of the characteristic „contribution to solving real-world challenges" and ranges from basic understanding to the development of solutions and support in practical implementation. The horizontal axis shows the type of practical relevance as the second dimension. Here, the characteristics of formats without direct contact to external partners, approaches with contact and close external cooperation are shown. The coloring of the ellipses represents the third dimension „Degree of cooperation between stakeholder groups". These range from formats in which students work and learn among themselves (unilateral) to those in which students cooperate with external partners (bilateral) to the trilateral approach, in which cooperation takes place between teachers, students and external partners.

The matrix quickly shows that most concepts have direct external contact, but very few involve close cooperation with external partners. In the „contribution to solving real-world challenges" dimension, too, the focus of most practice-based teaching and learning concepts is on understanding a problem, less on developing solutions and even more rarely on actually supporting the imple-

Figure 3: Matrix of practice-oriented teaching-learning concepts

Source: Own.

mentation of developed ideas. This characteristic, among others, highlights the potential of Challenge-based Learning and in particular the version of Challenge-based Learning as co-innovation[18]. The characteristic of the trilateral approach also stands in contrast to the mostly bilateral concepts, in which the focus is on the interaction between students and practice partners.

Challenge-based Learning as the „3rd pillar of teaching"

Against this background, Challenge-based Learning can be classified as an independent type of higher education teaching and learning. In addition to the traditional teaching formats (lectures, seminars, etc.), which can be described as the „1st pillar" of teaching, and research-based learning as the „2nd pillar", Challenge-based Learning can be characterized as the „3rd pillar" of teaching in higher education.

18 In this version, the two future concepts of the teaching-learning approach of Challenge-based Learning are combined with the approach of collaborative innovation projects between students and companies as a new form of „co-innovation" and „open innovation"

5 Barriers to dissemination

Although the demand for Challenge-based Learning is growing and previous experiences with co-innovation projects between students and companies provide convincing arguments (see chapter 3), they have so far only made up a fraction of the teaching and transfer offerings of universities. Why is this the case? As part of the future discourse „Democratizing Innovation", interviews with experts from the education and innovation system identified barriers that have so far made it difficult for these approaches to spread. These are shown in the following table:

Table 3: Barriers to the dissemination of Challenge-based Learning (CBL) and co-innovation projects

Low level of awareness and lack of knowledge and experience with CBL and co-innovation projects; accordingly, the potential and opportunities are hardly known among university management, teaching staff, transfer managers and companies to date

Lack of support services and tools for lecturers and external partners: Although a few universities already have their own CBL support units and initial external support services [19], there is still a lack of support for lecturers and practice partners

Lack of anchoring in teaching programs: CBL and co-innovation are hardly anchored in teaching programs and do not represent a separate teaching category in curriculum development. Lack of clarity as to whether CBL is part of the compulsory, elective or professionalization area

Uncertainties among teachers regarding the effort involved in this teaching format, the changed role as a teacher, the approach and acquisition of suitable practice partners and the design of suitable challenges

Lack of responsibility and transparency: lack of central contact persons for teachers and corporate partners. Lack of overview of processes, participation opportunities, expectations, tasks

Lack of experience and qualification of teaching staff of higher education institutions for this type of teaching

Transfer is often not a top priority: Although knowledge transfer, cooperation with industry and the promotion of start-ups have gained in importance, the „third mission" is still often not a top priority for university management. Transfer-oriented teaching is not yet a strategic element of universities

Uncertainty among companies about the benefits, effort, advantages and impact of joint innovation projects with students

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19 see Widrat & Fichter (2023)

6 Enablers for Challenge-based Learning and co-innovation

Based on literature evaluations, the dialogues and interviews conducted as part of the future discourse „Democratizing Innovation" and the many years of experience of the Chair of Innovation Management and Sustainability at the University of Oldenburg, including the EU-funded projects „ScaleUp4Sustainability" and „Challenge4Impact"[20], the following factors can be identified that promote the implementation and dissemination of Challenge-based Learning and co-innovation projects between students and companies (enablers).

Table 4: Factors that favor the implementation and dissemination of CBL and co-innovation

Policy: Anchoring CBL and co-innovation in strategies and initiatives of higher education, transfer and innovation policy, e.g. analogous to the quality pact for teaching „Focus on research-based learning" of the German government, with study quality funds to improve the quality of teaching or innovation and start-up-related initiatives of Niedersachsen.next[21]

Teaching portfolio: Consideration of Challenge-based Learning as a separate teaching category in the teaching portfolio and curriculum development

University strategy: Anchoring CBL and co-innovation in the teaching and transfer strategies of universities (e.g. with the help of independent strategy papers[22]) and setting up funding opportunities analogous to the „research-based learning" project funding of the University of Oldenburg[23], which are financed from study quality funds

Professional communication of benefits, opportunities, examples and handouts to inform, sensitize and motivate teachers, university management and practice partners

Transformation and sustainability initiatives: Inclusion in municipal, regional and state-wide transformation and sustainability initiatives, strategies and networks such as the Alliance for Sustainability of Lower Saxony[24]

Visibility and tangibility: By communicating best practices, illustrative examples and successes, CBL can be better understood by the target groups as a new form of practice-oriented teaching and has a motivating effect

20 https://www.challenge4impact.eu and https://www.scaleup4sustainability.eu (last accessed 19.11.2024).
21 https://niedersachsen-next.de (last accessed on 19.11.2024).
22 see. e.g. the strategy paper „Research-based teaching and learning at the University of Oldenburg" at https://uol.de/fileadmin/user_upload/lehre/flif/forschen-at-studium_Grundlagenpapier-2017_print.pdf?v=1502975364 (last accessed on 20.11.2024)

23 https://uol.de/fileadmin/user_upload/lehre/flif/Homepage_neu/ForschenATstudium/Informationsblatt_Projektfoerderung_FL_2024.pdf?v=1713172098 (last accessed on 19.11.2024)
24 https://www.nachhaltigkeitsallianz.de (last accessed on 19.11.2024).

Table 4: Factors that favor the implementation and dissemination of CBL and co-innovation

Support services: Professional support services are needed to attract many teachers to CBL. Within universities, for instance, these can be centralized and decentralized offices and contact persons analogous to research-based learning[25]. However, as a recent analysis shows, there are now also support services and tools outside the university

Establishing a CBL community, e.g. through CBL ambassadors within the universities, through cross-university long-term cooperation such as in the ECIU network[26], exchange of good practices[27], international platforms[28] and the establishment of student alumni networks

Networking with regional or state-wide part-ners and initiatives, e.g. the matchmaking from Niedersachsen.next Startup on the „innomatch" platform[29], clusters such as OLEC[30], hubs such as „hallig hanken"[31] or Startup Factories

Information and qualification offers for teachers and companies on the subject of Challenge-based Learning and co-innovation

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Impact monitoring and impact management of CBL and co-innovation to record and present the outcomes on students and practice partners as well as impacts on markets, regions and sustain-ability

Benefits and incentives for students: In addi-tion to the experience that participation is „fun" and „meaningful", formal benefits such as credit points (ECTS) and recognition in the form of uni-versity certificates (e.g. „microcredentials"[32]) and „cooperation certificates" from external partners are also important incentives for students to participate

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25 For example https://uol.de/forschen-at-studium/foerderung (last accessed on 19.11.2024).
26 https://www.eciu.eu (accessed on 19.11.2024)
27 See the EU-funded projects https://www.challenge4impact.eu and https://www.scaleup4sustainability.eu (accessed 19.11.2024).
28 https://platform.scaleup4sustainability.eu (last accessed on 19.11.2024)
29 https://startup.nds.de/startup-matchmaking/ (last accessed on 19.11.2024).
30 https://www.energiecluster.de/de (last accessed 19.11.2024).
31 https://www.hallighanken.de (last accessed 19.11.2024).
31 On the importance of microcredentials, see Stifterverband für die Deutsche Wissenschaft (2024, p. 22 ff.)

7 Recommendations for professionalization and dissemination

Based on the analyses carried out as part of the future discourse „Democratizing Innovation" and the results of the various dialogue formats with stakeholders, three central recommendations for action can be formulated for the dissemination and professionalization of Challenge-based Learning as a novel practice-oriented teaching/learning approach and of co-innovation projects between students and companies:

Establishment as „3rd pillar of teaching" and new format fostering innovation

Finding 1: Challenge-based Learning (CBL) and co-innovation approaches show convincing advantages and potential but are hardly widespread to date. Although Challenge-based Learning offerings and the co-innovation communities have been growing continuously for years, this new teaching and learning approach and this new form of innovation cooperation are still in a niche.

Recommendation 1: In addition to traditional teaching and approaches to research-based learning, Challenge-based Learning should be supported and established as the „3rd pillar of teaching" and as a new format fostering innovation through new federal, state or regional funding programs. Due to the fact that these new teaching, learning and innovation formats are located at the interface between the science and innovation system, joint or coordinated funding programmes by the Ministry of Science and Culture of the State of Lower Saxony (MWK) in the context of zukunft.niedersachsen and the Ministry of Economic Affairs, Transport, Building and Digitalization of Lower Saxony in conjunction with state-wide transformation strategies are conceivable in Lower Saxony, for example. A share of 10 percent of the total teaching programme of universities by 2035 appears to be an appropriate target for modernizing the university system and increasing the innovation capacity of Lower Saxony, Germany and Europe.

Educating on the benefits and potential of Challenge-based Learning and co-innovation

Finding 2: Previous studies show the considerable advantages and potential of Challenge-based Learning (CBL) and co-innovation projects between students and companies. However, they also make it clear that these new approaches at the interface between teaching and practice or between the education and innovation system are still largely unknown and underestimated in politics and among university management, teachers, transfer managers and companies.

Recommendation 2: Without comprehensive and professional information and education measures for policymakers, university management, teaching staff, transfer managers, business associations and companies on the potential of Challenge-based Learning, it will not be possible to implement Challenge-based Learning on a broad scale and establish it as a relevant new „pillar" of teaching and the innovation system. Accordingly, good and clear information materials with precise examples of good practice as well as target group-oriented event and communication formats for university lecturers, transfer managers and companies are needed in order to publicize the advantages and successes of this new format of practice-oriented university teaching and innovation-oriented cooperation projects between students and practice partners.

Professional support services as a key enabler

Finding 3: Challenge-based Learning requires lecturers to have a fundamentally changed understanding of future-relevant skills transfer and extended qualifications. In addition, the preparation and implementation of Challenge-based Learning modules and co-innovation projects requires access to external partners, which many university lecturers do not have. It is also apparent that many companies are interested in innovation collaborations with universities, but there is a lack of clearly visible contact persons (key accounts) and a lack of transparency regarding requirements, expectations and specific processes.

Recommendation 3: The dissemination and establishment of Challenge-based Learning as the „3rd pillar" of teaching and co-innovation will only succeed if it is attractive to a large group of teachers and external partners and the necessary qualifications are available. To this end, professional support services must be developed in a similar way to research-based learning, which provide effective support in the preparation and implementation of Challenge-based Learning modules and co-innovation projects. There are already very good examples of best practice for internal university service points as well as for professional external service providers who support the initiation, organization and implementation of challenges and co-innovation projects.[33] This means that lecturers do not have to invest more time and effort than in traditional teaching and companies benefit from a positive cost-benefit ratio when participating in challenge formats and co-innovation projects.

Target group-related recommendations for action

Relevant conclusions can be drawn from the findings and dialogs of the future discourse for the various stakeholders in higher education teaching and the innovation system. These are listed in the following table:

33 See Widrat & Fichter (2023).

Table 5: Target group-related recommendations for action

Stakeholder	Recommendation for action
Politics	• Anchoring of Challenge-based Learning and co-innovation in strategies and initiatives of higher education, transfer and innovation policy, e.g. analogous to strategies of research-based learning and study quality funds to improve the quality of teaching, or in the form of an innovation and start-up-related initiative such as „Co-Innovation" by Niedersachsen.next in Lower Saxony • Initiation of targeted funding programmes for the dissemination and professionalization of Challenge-based Learning and co-innovation formats between students and companies • Provision of funding for the establishment and expansion of internal and external university support services for Challenge-based Learning and co-innovation. These can build on existing good practices[34] • Support for new information and qualification offers for teachers and companies on the subject of Challenge-based Learning and co-innovation
University management	• Anchoring Challenge-based Learning and co-innovation in the university's teaching and transfer strategy, including its positioning as a feature of excellence in modern university teaching, the promotion of future skills and effective transfer work • Expansion of cooperation with (regional) partners from business, society and innovation and transfer institutions to establish efficient support structures for Challenge-based Learning and co-innovation[35] • Anchoring Challenge-based Learning in the teaching portfolio and curricula, e.g. with the aim of achieving a 10% share in the teaching portfolio by 2035 • Establishment of support services and funding offers analogous to the „research-based learning" project funding, which are financed from study quality funds • Establishing and expanding qualification opportunities for teachers for Challenge-based Learning and creating incentives for their use, e.g. by reducing teaching loads

34 See Widrat & Fichter (2023).
35 See Stifterverband für die deutsche Wirtschaft, 2024

Table 5: Target group-related recommendations for action

Stakeholder	Recommendation for action
University lecturers	• Familiarize themselves with existing information offerings and colleagues with Challenge-based Learning (CBL) and examine for their own teaching offerings • Use of (emerging) further training courses on CBL and co-innovation • Use of (emerging) support services and tools from own university or from external service providers for Challenge-based Learning and co-innovation[36] • Sharing own experiences with colleagues • Networking with regional or state-wide partners and initiatives, e.g. the matchmaking from Niedersachsen.next Startup on the „innomatch" platform, clusters such as the Oldenburg Energy Cluster OLEC, hubs such as „hallig hanken" or Startup Factories
Transfer and innovation managers	• Integration of practice- and transfer-oriented teaching as an important field in transfer strategy • Establishing and expanding contacts with teachers and practice representatives • Ensuring a highly visible central point of contact for companies and external partners for co-innovation formats • Use of Challenge-based Learning and co-innovation formats to establish and maintain contacts with external partners • Expansion of regional cooperation opportunities to promote CBL (e.g. startup factories) • Provision of support services for CBL and co-innovation • Use of CBL and co-innovation to sensitize and qualify students for start-ups and to support e.g. EXIST-funded start-up teams as external partners

36 See Widrat & Fichter (2023).

Table 5: Target group-related recommendations for action

Stakeholder	Recommendation for action
Companies, business associations and business development	• Organization of information events for companies on the opportunities and requirements for co-innovation projects with students/university lecturers by chambers of commerce and business associations • Central contact person for companies at chambers of commerce and associations for establishing contacts with universities and/or transfer institutions • Visibility and tangibility for practice partners: Regular information for companies, e.g. via existing newsletters on the co-innovation offers of universities, best practices and experiences, provision of matchmaking offers • Establishment of collaborative (regional) support structures for the initiation and implementation of co-innovation projects between students and companies

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Sources

Draghi, M. (2024). *The future of European competitiveness, Part A | A competitiveness strategy for Europe. September 2024. B*russels.

Eldebo, K., & Hjelm, O. (2024). *Handbook for Co-signing Student-Business Sustainability Challenges - Setup, Digitalization, and Internationalization.* Linköping: Linköping University.

Gallagher, S. E., & Savage, T. (2020). Challenge-based learning in higher education: An exploratory literature review. *Teaching in Higher Education, 1-23.* https://doi.org/10.1080/13562517.2020.1863354

Malmqvist, J., Kohn Radberg, K., & Lundqvist, U. (2015). Comparative analysis of challenge-based learning experiences. *Proceedings of the 11th International CDIO Conference.* Presented at the 11th International CDIO Conference, Chengdu University of Information Technology, Chengdu, Sichuan, P.R. China, June 8-11, 2015, Chengdu, Sichuan, P.R. China. Chengdu, Sichuan, P.R. China. Retrieved from http://rick.sellens.ca/CDIO2015/final/14/14_Paper.pdf

Ministry for Federal and European Affairs and Regional Development of Lower Saxony (ed.). (2020). *Lower Saxony Regional Innovation Strategy for Smart Specialization (RIS3)-Regional and Structural Policy of the EU in the Period 2021-2027.* Hannover.

Stifterverband für die Deutsche Wissenschaft (ed.). (2024). *New forms of tertiary education-Innovative future concepts for higher education and what we can learn from them.* Berlin.

Widrat, A., & Fichter, Klaus. (2023). *Support services for student business collaboration. Good practice collection of support services for challenge-based student-business collaboration in sustainable entrepreneurship.* Oldenburg: Carl von Ossietzky University of Oldenburg

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