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euRoepan bio-Economy aLliance in Farming

Training and Assessment Methodology

Deliverable D3.2

Olympic Training and Consulting
IBO

Project Number: 101056181



Document information

Project title:	euRopean bio-Economy aLlianceE in Farming
Project Acronym:	RELIEF
Programme:	Erasmus + Key Action 2 – Lot 1 – Alliances for Education and Enterprises
Project Number:	101056181
Start date:	01 June 2022
End date:	31 May 2025
Work Package:	3
Related WP(s):	all
Lead Organisation	Olympic Training and Consulting
Dissemination level	Public
Document's name	Training and Assessment Methodology Report – version 1
Type	Report
No Deliverable	3.2

Document History (only major changes to the document structure)

Version	Date	Submitted by	Reviewed by	Notes
VER 0.1	July 2023	IBO	All	Draft of the Training methodology and Innovative

				Techniques structure
VER 0.2	September 2023	IBO	All	Revised version of the Training Methodology and Innovative Techniques report
VER 0.3	September 2023	OTC	All	First draft of the Assessment Methodology
VER1	October 2023	OTC	All	First draft of the final version of the Deliverable
VER2	October 2023	OTC	All	Finalized Version

Document Location

The latest version of this controlled document is stored in Basecamp -> WP3 -> Deliverables folder:

<https://3.basecamp.com/4440716/buckets/29581489/vaults/6641183261>

List with Abbreviations

Acronym	Abbreviation
WBL	Work Based Learning
HEI	Higher Education Institute
VET	Vocational Education and Training
STEM	Science, technology, engineering, and mathematics (STEM) is an umbrella term used to group together the distinct but related technical disciplines of science, technology, engineering, and mathematics.
PBL	Project Based Learning
F2F	Face-To-Face training

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Project summary

The general goal of RELIEF “euRopean bio-Economy aLliancE In Farming” is to foster the potential of HE and VET to provide new training approach, innovative learning material and training practices in the field of bio-economy focusing to open up new learning opportunities for the embedding of bio-economy principles and practices in farming.

The project objectives are:

- to design a training approach starting from the skills needed to facilitate the transition of farming sector to bioeconomy;
- to enhance the knowledge, skills and competencies of HE students, agronomists, farmer consultants in bioeconomy and prepare them to support farmers towards the transition process;
- to develop an innovative and multidisciplinary approach for teaching the integration of bioeconomy principles and practices in farming;
- to promote the cooperation and co-creation of knowledge between higher education (HE) and vocational education and training (VET), research, and the business farming sector in order to contribute to innovation in business modelling based on bioeconomy and in education and training;
- to empower multiple stakeholders in agriculture, policy makers, regional governments across Europe to utilize high quality, state-of-the-art learning resources, available through an e-learning repository, for the knowledge in bioeconomy to be developed and spread.

Introduction

1.1 Scope of this Report

The purpose of this report is to present the training and assessment methodology of RELIEF. The link between the form and content of training, its delivery and its evaluation, the so-called training methods - techniques and training assessment constitute basic educational principle.

This document consists of three parts. The first part concerns the “Training Methodology” and presents the learning theories, pedagogies and principles followed in RELIEF along with guidelines and suggestions regarding training methods and techniques suitable for all phases of RELIEF training program such as: a) face to face, b) on-line training, and c) work-based learning (WBL).

The second part presents the Innovative Training Techniques that are used to complement the overall training methodology approach of RELIEF and introduces in detail innovative training techniques as well as recommendations for their application to the farming sector, aiming to enhance the adoption of bioeconomy thinking.

The third part regards the “Assessment Methodology” of the RELIEF training courses and presents the methodology and tools recommended for RELIEF per method of training delivery. The proposed methodology is based upon learning theories and approaches identified by the consortium through the Training Methodology report, with the aim to assess the desired learning outcomes, as they have been predetermined within the framework of “D2.2 – RELIEF Curriculum”.

1.2 Audience of the document

The audience of the Training and Assessment Methodology is a) the RELIEF project partners who will undertake the implementation of the RELIEF training courses both in HEI and VET levels, and therefore will be responsible for applying the monitoring and assessment of the project’s training, b) the agribusiness that will participate in RELIEF through the implementation of the study visits for the Work-Based Learning (WBL) of the various target groups, c) HEIs and VET providers that could provide the full RELIEF training scheme or implement parts of the training courses, d) trainers, educators and professors who could use the theoretical background and practical suggestions on how to assess the RELIEF courses in the field of Bioeconomy.

The document serves as a source of the training and assessment methodology to be undertaken by the project participants in the piloting of RELIEF training.

PART A: Training Methodology

2.1 Theoretical Approach and Justification

The RELIEF curriculum and learning approach is supported by a number of learning theories that place the learner at the center of the learning process, emphasizing their active engagement, critical thinking, and personal growth. These approaches recognize that the learner is not a passive recipient of knowledge but an active participant in constructing their understanding, exploring real-world applications, challenging assumptions, and collaborating with others. By placing the learner at the center, these theories and methodologies aim to create dynamic and meaningful learning experiences that empower students to become lifelong learners and agents of change in their respective fields.

The learning theories that support this approach include:

- constructivist learning theory
- experiential learning
- transformative learning
- problem based learning
- blended learning
- collaborative- group learning
- design thinking

The bioeconomy is inherently an interdisciplinary concept and needs to adopt interdisciplinary learning and teaching approaches that are often focused on bringing together and integrating the STEM disciplines with the SSH (social sciences and humanities) disciplines (Paris et al., 2023).



Figure 1. The RELIEF learning approach

2.1.1 Constructivist Learning Approach

RELIEF uses a constructivist approach to education, by adopting this approach, trainers/educators can create a rich and interactive learning environment that equips students with the knowledge and competencies needed for farming in the bioeconomy.

Constructivist learning approach suggests that learners actively construct knowledge by engaging with their environment and interacting with others. It emphasizes the importance of hands-on experiences, collaborative learning, and critical thinking (Chuang, 2021). Constructivism posits that learning occurs through meaningful engagement with the environment, social interactions, and personal reflection. Learners build upon their existing knowledge and beliefs, actively construct new understandings, and constantly adapt their mental frameworks to accommodate new information (Kurt, 2021).

In the constructivist learning approach, trainers/educators serve as facilitators and guides rather than authoritative sources of knowledge. They create environments and design learning experiences that encourage exploration, inquiry, and critical thinking. Teachers facilitate discussions, ask thought-provoking questions, and provide opportunities for students to engage in hands-on activities and real-world applications. Through these experiences, learners develop a deeper understanding of concepts and actively construct their knowledge. Constructivism also emphasizes the importance of social interaction and collaboration. Students learn through sharing ideas, engaging in discussions, and working together on projects (Krahenbuhl, 2016).

The constructivist learning approach recognizes the importance of connecting new information to prior knowledge and experiences. It emphasizes the contextualization of learning by integrating real-world situations, problems, and examples into the educational process. By linking concepts to practical applications, learners develop a deeper understanding of how knowledge is relevant and applicable in their lives (Chuang, 2021).

2.1.2 Experiential Learning

Experiential learning is an educational approach that emphasizes learning through direct experience and reflection. It involves active engagement in hands-on activities and real-world applications, where learners construct their understanding and draw insights from their experiences. This approach is beneficial for students as it promotes engagement, relevance, and deeper understanding. By actively participating in meaningful experiences, students can apply theoretical knowledge in practical contexts, develop critical thinking and problem-solving skills, and enhance their retention and transfer of knowledge (Center for Teaching and Learning, 2015).

For trainers/ educators, experiential learning is relevant as it allows them to create dynamic and engaging learning environments. Experiential learning encourages student-centered approaches, where trainers/educators serve as facilitators and guides in the learning process. It provides opportunities for trainers/educators to promote critical thinking, problem-solving skills, and collaboration. (Girvan et al., 2016).

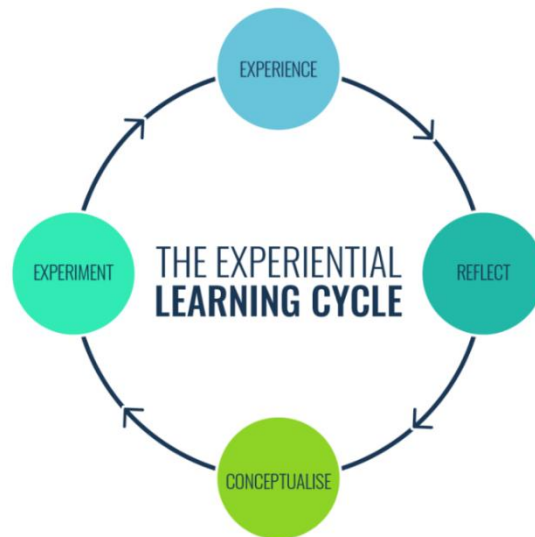


Figure 2. The experiential learning cycle (Growth Engineering, 2021).

2.1.3 Active Learning

Active learning is an educational approach that engages learners in the learning process through active participation and hands-on activities. Rather than passively receiving information, students are encouraged to actively explore, discuss, and apply concepts. This approach promotes critical thinking, problem-solving, and deeper understanding of the subject matter. Active learning methods include group discussions, collaborative projects, simulations, hands-on experiments, and problem-solving scenarios, all of which encourage students to be active participants in their own learning journey.

2.1.4 Transformative Learning

Transformative learning is an educational approach that focuses personal and intellectual growth through critical reflection and the questioning of assumptions. It involves a shift in individuals' understanding of themselves and the world, resulting in transformative change. This approach encourages learners to critically examine their existing beliefs, values, and perspectives, challenging them to explore new ideas, embrace diverse viewpoints, and broaden their understanding (Cranton, 1996).

Using transformative learning in teaching the bioeconomy in farming is particularly beneficial as it can empower farmers and students to navigate the challenges and opportunities presented by

sustainable agricultural practices. Transformative learning encourages students, consultants and farmers to critically reflect on current farming methods, explore alternative approaches rooted in ecological sustainability, and embrace innovative practices aligned with the principles of the bioeconomy (Cranton, 1996).

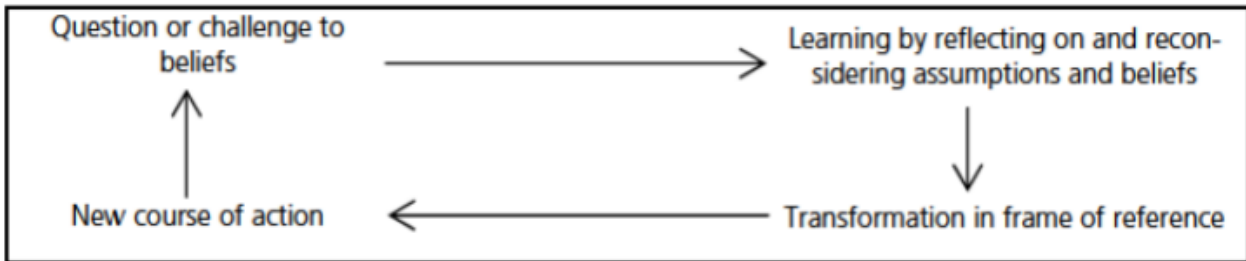


Figure 3. Mezirow's Transformative learning model (Bélanger, 2011)

2.1.5 Problem based learning (PBL)

Problem-based learning (PBL) is an instructional approach that revolves around students working collaboratively to solve authentic, real-world problems. It emphasizes active engagement, critical thinking, and knowledge application. In PBL, students are presented with a complex problem or scenario that mirrors challenges they may encounter in the real world. They work in small groups, exploring the problem, conducting research, and developing solutions through a process of inquiry, analysis, and reflection. PBL promotes deep learning as students navigate through the problem, integrating and applying their knowledge to develop viable solutions. It also fosters essential skills such as teamwork, communication, and problem-solving, preparing students for real-world situations (Allen et al., 2011).

Using PBL in teaching the bioeconomy in farming is relevant as farming involves complex challenges such as sustainable resource management, agroecological practices, and market integration. PBL provides a practical and relevant approach to address these challenges. By engaging students in problem-solving scenarios related to the bioeconomy. (De Graaff & Kolmos, n.d.).

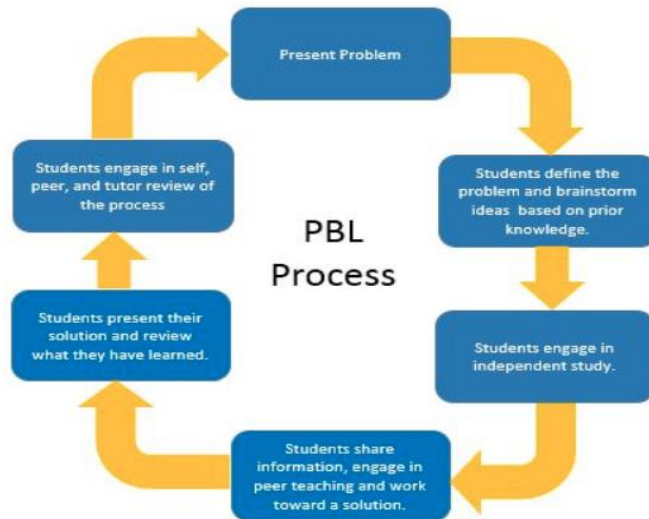


Figure 4. Problem based learning process (UNSDG Project, nd)

2.1.6 Blended learning

Blended learning combines traditional face-to-face instruction with online learning components. It integrates the virtual and in-person learning environments to create a comprehensive and flexible learning experience. In blended learning, students engage in a variety of activities, including interactive online modules, virtual discussions, and collaborative projects, as well as in-person interactions with instructors and peers. This approach allows for personalized learning, promotes active engagement, and offers opportunities for self-paced study, while also providing valuable face-to-face interactions for deeper discussions, hands-on activities, and practical application of concepts (Hrastinski, 2019). Blended learning is relevant to teaching farming and the bioeconomy due to its ability to offer a diverse range of learning opportunities and resources. (Rasheed et al., 2020).

2.1.7 Collaborative-group learning

Collaborative group learning emphasizes learning through active collaboration and interaction among students. In this approach, students work together in groups, engaging in discussions, problem-solving activities, and knowledge sharing. Collaborative group learning promotes peer-to-peer learning, encourages diverse perspectives, and fosters the development of critical thinking, communication, and teamwork skills. By working collaboratively, students can construct meaning collectively, challenge their own assumptions, and build a deeper understanding of the subject matter (Freeth & Caniglia, 2020).

2.1.8 Design thinking

Design thinking is a human-centered approach to problem-solving and innovation that emphasizes empathy, collaboration, and iterative processes. It involves understanding the needs and perspectives of end-users, brainstorming creative solutions, prototyping and testing ideas, and

refining them based on feedback. Design thinking encourages a mindset of curiosity, experimentation, and learning from failures. It is characterized by its emphasis on both analytical and creative thinking, as well as the integration of diverse perspectives and disciplines (Braun & Clarke, 2021; Pande & Bharathi, 2020). The complex challenges in the bioeconomy require innovative and sustainable solutions, and design thinking provides a structured approach to address them. By integrating design thinking principles into agricultural education, farmers can develop a deep understanding of the needs of the agricultural system, the environment, and the local community. (Earle & Leyva-de la Hiz, 2021) .

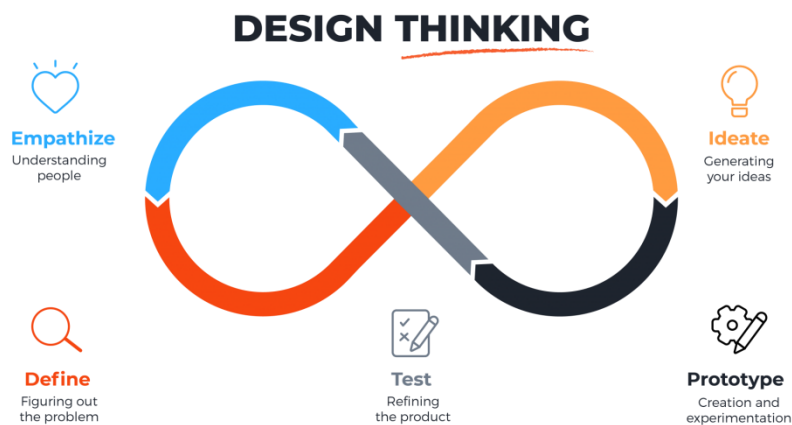


Figure 5. Design thinking approach (Karl, 2020)

2.1.9 Principles of adult education

The principles of adult education, also known as andragogy, are based on the understanding of how adults learn and are different from the principles of pedagogy, which focus on child learning. The principles of adult education were initially developed by Malcolm Knowles and are centered around several key concepts:

- **Self-directed Learning:** Adults are more motivated to learn when they have control over their learning process. They prefer to be active participants in setting their learning goals, choosing the learning methods, and taking responsibility for their own learning progress.
- **Relevant and Practical Learning:** Adult learners are more engaged when the content is relevant to their life experiences and has direct applicability in their personal or professional contexts. They value practical knowledge that they can immediately apply.
- **Experience as a Resource:** Adult learners bring a wealth of experiences to the learning environment. These experiences can serve as a valuable resource for connecting new knowledge to their existing understanding.
- **Problem-Centered Approach:** Adults are more motivated to learn when the learning process addresses their specific problems and challenges. Problem-centered learning allows learners to develop skills and knowledge through solving real-world issues.

- **Collaboration and Dialogue:** Adult learners benefit from collaborative learning environments where they can engage in discussions, share ideas, and learn from their peers. Dialogue and interaction promote a deeper understanding of the subject matter.
- **Respect for Learners:** Adult learners have accumulated a lifetime of experiences and expertise. As such, they deserve respect for their prior knowledge and are more motivated to learn when they are treated as respected individuals.
- **Immediate Application:** Adult learners prefer learning that has immediate relevance and application in their lives. They are more motivated to learn when they can see how the knowledge and skills they acquire can be used in practical situations.

2.1.10 Principles of soft skills learning

The principles of soft skills learning focus on creating effective learning experiences to develop interpersonal and intrapersonal skills. They emphasize experiential learning, active participation, personalization, feedback, and reflection. Integrating soft skills development with technical training, promoting real-world application, and fostering a positive learning environment are key aspects. Continuous learning is encouraged, recognizing that soft skills development is an ongoing journey. By following these principles, educators can nurture well-rounded and adaptable individuals who excel in various personal and professional contexts.

2.2 Recommended Training Methodologies and techniques

Following the outlined theoretical approach and justification the learning approaches and associated training techniques and procedures are chosen based on the content, duration and learning outcomes of the RELIEF curriculum learning units. All courses designed as part of the RELIEF curriculum are designed to use three training methodologies: Face to Face learning, Online learning, and work-based learning.

These three learning methodologies were chosen as combined they follow the theoretical approach outlined in the previous section and offer the learner detailed content, a mixture of theoretical and practical education and flexibility. Generally RELIEF follows a modular approach where learning units focus on a specific topic or concept and can be completed independently or in combination with other modules.

2.2.1 Face-to-Face Learning

Face-to-face learning refers to the traditional mode of education where students and teachers physically gather in a shared physical space, such as a classroom or lecture hall, for the purpose of instruction and learning. It involves direct interaction and communication between students and teachers, allowing for immediate feedback, active participation, and real-time discussions. Face-to-face learning offers the advantages of personal connection, social interaction, and the ability to

engage in non-verbal cues, fostering a dynamic learning environment. It allows for hands-on activities, collaborative projects, and immediate clarification of concepts.

It is recommended that the training methods for face-to-face learning fulfil the following criteria:

- promote active engagement and participation,
- incorporate interactive and hands-on activities,
- align with the learning objectives of the learning units,
- cater to diverse learning styles and preferences,
- encourage collaboration and group work,
- provide opportunities for immediate feedback and clarification,
- be adaptable to individual learner needs,
- utilize effective instructional strategies and techniques,
- create a supportive and inclusive learning environment.

2.2.1.1 Recommended Techniques

The appropriate techniques used for face to face learning are dependent on the learning unit and style of the educator. A large number of techniques are available and well-documented the general recommended that the educator uses are as follows:

Lectures

Face-to-face lectures in educational programs involve an educator delivering a structured presentation or lecture to a group of students in a physical classroom setting. The educator typically conveys information, explanations, and concepts to students through spoken communication, supported by visual aids or multimedia resources. Face-to-face lectures provide opportunities for direct interaction between the educator and students, allowing for immediate clarification of concepts and the ability to address questions in real-time.

For lectures it is recommended that trainers/educators follow these guidelines:

1. Carefully plan and organize lectures aligned with learning objectives.
2. Incorporate interactive elements within the lecture, such as asking questions, encouraging discussions, or using real-world examples.
3. Use visual aids, such as slides, diagrams, or videos.
4. Encourage student engagement by actively involving them in the learning process. This can be achieved by asking open-ended questions, promoting class discussions.
5. Provide opportunities for reflection and synthesis of the lecture content.

Tutorials

Tutorials are small-group sessions where students meet with an educator to discuss and deepen their understanding of course content. These sessions provide an opportunity for interactive learning, clarifying concepts, asking questions, and engaging in discussions with peers and the

educator. Tutorials often involve activities such as problem-solving exercises, case studies, debates, or presentations.

For tutorials it is recommended that trainers/educators follow these guidelines:

1. Adjust the pace or approach to accommodate different learning styles and preferences.
2. Encourage collaboration and group work can also enhance the learning experience, as students can learn from and support each other.
3. Trainers/educators should foster a supportive atmosphere that promotes open dialogue and respectful interactions.
4. Encourage students to actively engage by asking thought-provoking questions, encouraging different perspectives, and providing guidance to keep the conversation focused.
5. Provide timely and constructive feedback, both individually and to the group, to enhance understanding and encourage critical thinking.
6. Incorporate relevant real-life examples, visuals, or hands-on activities to make the tutorials more engaging and practical.

Practical Activities (individual or in groups) and Case studies

Practical scenarios in face-to-face educational programs involve creating real-life situations or simulations, or case studies that allow students to apply their knowledge and skills in a hands-on manner. These scenarios often replicate authentic tasks or challenges that students may encounter in their respective fields. Through practical scenarios, students gain practical experience, problem-solving abilities, and critical thinking skills.

For practical activities it is recommended that trainers/educators follow these guidelines:

1. Provide a clear context and purpose for the scenario, ensuring students understand the relevance and goals of the activity.
2. Present realistic scenarios, providing background information, and defining the roles and responsibilities of the participants.
3. Encourage students to actively participate in the scenario, assuming relevant roles and actively engaging in the problem-solving process. This can involve group work, role-playing, hands-on activities, and discussions.
4. Provide necessary resources, tools, and materials, and offer assistance when students encounter challenges or need clarification.

Decision Making scenarios

Decision-making scenarios in educational programs are situations or case studies presented to students that require them to analyze information, evaluate options, and make informed choices. These scenarios aim to develop critical thinking skills, problem-solving abilities, and decision-making competencies in students. Students are typically presented with a dilemma, challenge, or complex

problem and are expected to consider various perspectives, weigh the pros and cons, and ultimately make a well-reasoned decision.

For decision making scenarios it is recommended that trainers/educators follow these guidelines:

1. Select or design scenarios that are relevant, engaging, and aligned with the learning objectives of the educational program.
2. Trainers/educators should provide clear instructions and guidance on how to approach the scenarios. They can introduce frameworks or decision-making models that students can use to structure their analysis and evaluation.
3. Facilitate discussions and encourage active participation.

Role Playing

Role playing is a teaching technique where students take on specific roles or characters to simulate real-life situations or scenarios. It allows students to actively engage in experiential learning, develop empathy, practice problem-solving, and enhance their communication and critical thinking skills. During role playing, students are encouraged to think and respond from the perspective of their assigned roles, fostering a deeper understanding of different viewpoints and promoting collaboration.

For role playing it is recommended that trainers/educators follow these guidelines:

1. Carefully select or design role play scenarios that align with the learning objectives and desired outcomes.
2. Explain the purpose of the activity, provide background information on the roles, and clearly define the expectations and objectives.
3. Establish a safe space where students feel comfortable taking risks, expressing their ideas, and actively participating in the role play.
4. Observe and facilitate the activity and intervene when necessary to provide guidance or clarification, monitor student progress.
5. Facilitate discussions where students share their observations, insights, and challenges.

2.2.2 Work based Learning

Work-based learning is an educational approach that integrates practical work experiences with classroom learning. It involves students actively engaging in real-world work environments, such as internships, apprenticeships, or cooperative education placements, to gain hands-on skills and knowledge. Work-based learning programs provide students with valuable opportunities to apply academic concepts in practical settings, develop professional skills, and establish connections with industry professionals. By bridging the gap between theory and practice, work-based learning equips students with the necessary competencies and experiences for successful transition into the workforce. It is recommended that the training methods for work-based learning fulfill the following criteria:

- Emphasize practical and experiential learning opportunities

- Integrate real-world work contexts and challenges
- Facilitate the application of theoretical knowledge to practical work situations
- Encourage reflection and critical thinking
- Promote the development of job-specific skills and competencies
- Foster collaboration and teamwork within workplace settings
- Offer opportunities for ongoing assessment and feedback
- Enable learners to build a network of professional connections and relationships

2.2.2.1 Recommended Techniques

The appropriate techniques used for work-based learning is dependent on the learning unit and style of the educator. A large number of techniques are available and well-documented the specific recommended ones for RELIEF are as follows:

Study visits

Study visits refer to organized trips or visits to specific locations, institutions, or events that provide students with firsthand experiences related to their studies. These visits aim to enhance learning by allowing students to observe, interact, and immerse themselves in real-world contexts relevant to their academic field.

For study visits it is recommended that trainers/educators follow these guidelines:

1. Set clear learning objectives, selecting appropriate destinations, and ensuring logistical arrangements are in place.
2. Provide relevant background information, introduce key concepts, and prepare students for what they will encounter during the visit.
3. Guide students, facilitate discussions, and encourage active engagement.
4. Encourage reflection and provide opportunities for students to process their experiences. This can be through discussions, reflective assignments, or group activities.
5. Connect the knowledge and experiences gained during the visit to their academic studies. This could involve relating the visit to future coursework, assignments, or projects.

Workshops

Workshops in educational programs are interactive sessions designed to provide hands-on learning experiences and practical skills development to participants. They are often used to enhance specific knowledge areas or teach specific techniques relevant to the educational program. Workshops typically involve active participation, group discussions, problem-solving activities, demonstrations, and sometimes include guest speakers or experts in the field.

For workshops it is recommended that trainers/educators follow these guidelines:

1. Clearly define the workshop objectives and learning outcomes to ensure participants have a clear understanding of what they will achieve.
2. Create a supportive and inclusive learning environment where participants feel comfortable to ask questions, share ideas, and collaborate with others.

3. Use various instructional strategies and techniques, such as interactive activities, case studies, simulations, and hands-on exercises, to engage participants actively.
4. Facilitate discussions and encourage active participation among participants, fostering a sense of community and shared learning.

Project based Analysis

Project-based assessment in educational programs is an approach where students demonstrate their understanding and skills by completing projects or tasks that simulate real-world situations. It focuses on applying knowledge and abilities to solve problems, analyze information, and create meaningful outcomes. Students are typically given a project prompt, and they work independently or in groups to plan, execute, and present their project.

For project based analysis it is recommended that trainers/educators follow these guidelines:

1. Clearly define the project's objectives and criteria for success, ensuring students understand the expectations and learning outcomes.
2. Provide guidance and support throughout the process, offering resources, scaffolding, and regular check-ins to monitor progress and provide feedback.
3. Creating a collaborative and interactive learning environment.
4. Encourage students to work together, fostering teamwork, communication, and shared responsibility.
5. Allow students to choose their project topics or formats that align with their interests and strengths promotes autonomy and ownership of learning.
6. Employ rubrics or criteria to evaluate the quality and completeness of the projects, considering not only the final outcomes but also the process, effort, and demonstration of key competencies.

2.2.3 Online Learning

Online learning, also known as e-learning or distance education, is a method of education that utilizes digital platforms and technologies to deliver educational content and facilitate learning experiences remotely. It allows students to access course materials, participate in interactive activities, and engage with instructors and peers through online platforms. Online learning provides flexibility in terms of time and location, enabling learners to study at their own pace and from any location with an internet connection.

It is recommended that the training methods for online learning fulfill the following criteria:

- Facilitate self-paced and flexible learning
- Utilize interactive and engaging multimedia resources
- Promote active learner participation through discussions and collaborative activities
- Offer opportunities for immediate feedback and assessment,
- Ensure accessibility for all learners,
- Encourage self-reflection and self-directed learning,

- Provide additional support and resources for learners to succeed in the online learning environment.

2.2.3.1 Recommended Techniques

The appropriate techniques used for online learning is dependent on the learning unit and style of the educator. A large number of techniques are available and well-documented the specific recommended ones for RELIEF are as follows:

Asynchronous Learning

Asynchronous online learning in educational programs refers to a learning approach where students engage in learning activities at different times and locations, rather than in real-time. It involves accessing pre-recorded lectures, reading materials, interactive modules, and participating in online discussions or assignments at their own pace.

For asynchronous learning it is recommended that trainers/educators follow these guidelines:

1. Provide regular and timely communication.
2. Establish clear guidelines and expectations, outlining how students can reach out for support or clarification.
3. Promptly respond to student inquiries, provide feedback on assignments, and facilitate online discussions to foster interaction and engagement among students.
4. Create opportunities for student collaboration and interaction. Trainers/educators can use design group projects, discussion boards, or virtual forums where students can engage in meaningful conversations, share ideas, and collaborate on assignments.
5. Encourage self-paced learning and provide flexibility allowing students to choose the path and pace that aligns with their learning preferences and schedules.
6. Providing options for self-assessment or self-reflection allowing students to monitor their progress and take ownership of their learning.
7. Monitor student progress and provide regular feedback.

Gamification

Gamification in online learning refers to the integration of game elements and mechanics into educational programs to enhance learner engagement, motivation, and participation. It involves incorporating elements like point systems, badges, leaderboards, challenges, and rewards to create a more interactive and immersive learning experience. Gamification aims to leverage the inherent enjoyment and sense of accomplishment that games provide to make learning more enjoyable and effective.

For gamification it is recommended that trainers/educators follow these guidelines:

1. Ensure that the gamified elements are aligned with the learning objectives and content.
2. Provide clear instructions and guidelines to ensure students understand how the gamification works and how it connects to their learning journey.

3. Introduce the game elements, rules, and expectations at the beginning, along with any necessary technical support or resources.
4. Create a sense of competition, collaboration, and achievement is important. Trainers/educators can incorporate leaderboards or achievements to foster healthy competition among learners, motivating them to actively participate and strive for success.
5. Provide timely feedback on students' performance and progress, acknowledging their achievements and offering guidance for improvement.

The following figure summarizes the proposed RELIEF methods and techniques to be used per method of delivery.

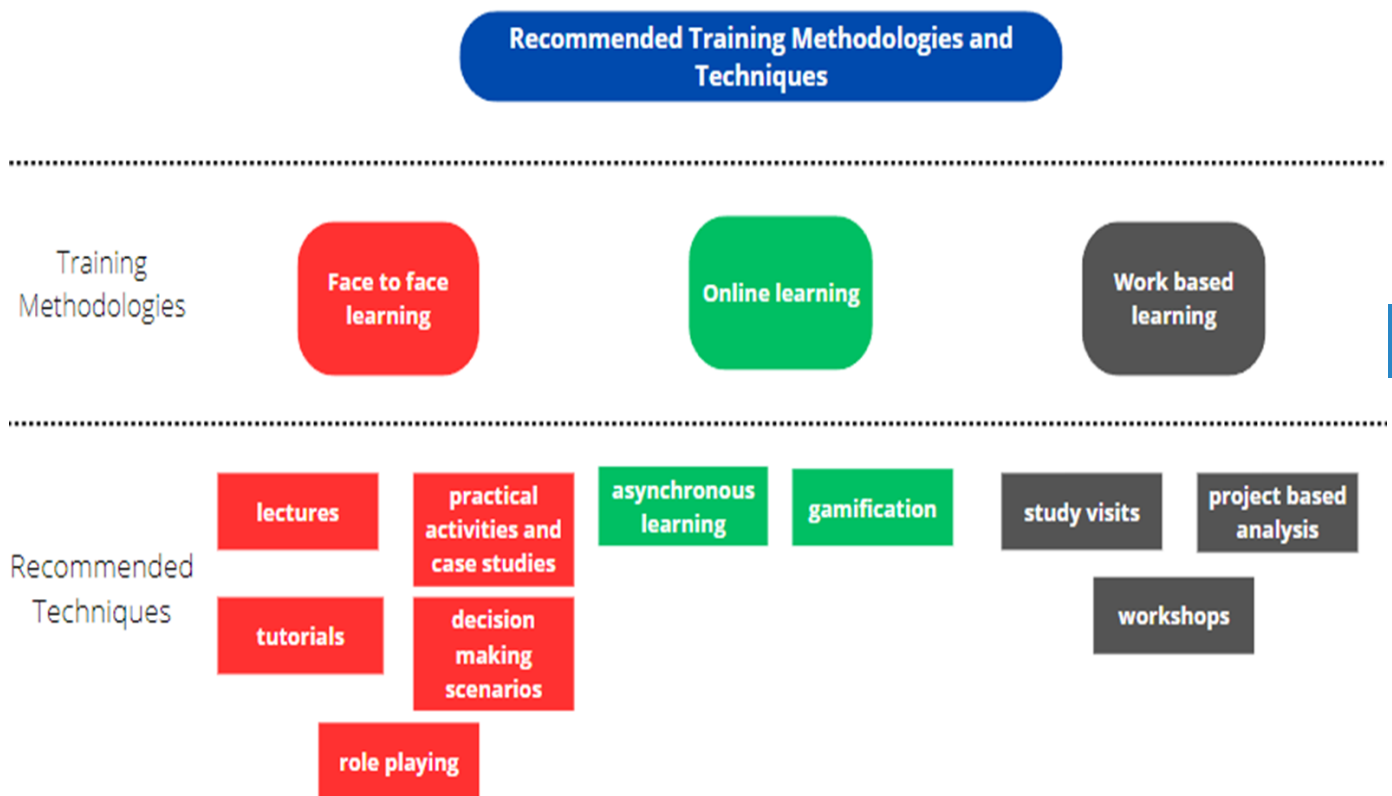


Figure 6. Summary of RELIEF Methods and Techniques

PART B: Recommended alternative learning techniques and tools

This section complements RELIEF's training methodology approach by introducing and recommending the use of alternative and innovative learning techniques and tools that come from other sectors but can be applied and are useful for teaching the RELIEF curriculum. Each technique is briefly described and highlighted why and how they are useful for bioeconomy education.

The recommended techniques are relevant to all RELIEF modules and learning units and it is recommended that trainers/educators actively use these where applicable. These techniques add to the trainers'/educators' toolkit and specific recommendations are given as to where they could be used. Overall, six practical alternative techniques have been chosen from entrepreneurship, transversal skills, rural development, sustainability, social and/or humanitarian sciences and technology enhanced learning methods and tools.

3.1 Identification and Selection Criteria

In our pursuit of cutting-edge and effective approaches within the realm of bioeconomy education, we have meticulously identified and chosen innovative techniques through a comprehensive process that encompasses various dimensions:

The identification of innovative techniques involved two primary avenues:

- **Thorough Desk Research and Literature Review:** Extensive desk-based research conducted by relevant partners. This encompassed scholarly bibliographies, publications, articles, and pertinent projects.
- **Engagement with Technique Providers:** This involved liaising with training providers, business advisory entities, counsellors, mentors, as well as organizations, associations, and networks offering guidance and support to individuals and enterprises operating within the bioeconomy.

The techniques were selected based on a number of criteria ensuring their alignment with the specific challenges and characteristics inherent to bioeconomy learning units. These criteria are as follows:

- **Relevance to Diverse Fields:** The chosen techniques span a broad spectrum of disciplines, including those relevant to bioeconomy education.
- **Adaptability to Varied Learning Pathways:** Each technique has been assessed for its compatibility with a range of learning methodologies applied in bioeconomy education, such as face-to-face training, work-based learning, and e-learning.

- **Integration with Proposed Pedagogies:** The selected techniques integrate with our proposed pedagogical approaches (such as active learning, experiential learning, problem-based learning, transformative learning and collaborative learning) for bioeconomy learning units.
- **Alignment with Bioeconomy Learning Units:** Relevant to at least one of the bioeconomy learning units, ensuring their practical applicability within this context.
- **Measurability and Tangible Outcomes:** All chosen techniques are designed to yield measurable and concrete results, enhancing their effectiveness in bioeconomy education.
- **Replicability and Transferability:** We prioritize techniques that are replicable and transferable, fostering scalability and adaptability across diverse contexts within bioeconomy education.
- **Feasibility and Compatibility:** The selected techniques needed to be feasible and fit with the training requirements within the framework of bioeconomy learning units.

3.2 Their application to RELIEF modules and learning units

The proposed innovative techniques can be applied in all modules and learning units based on the specific context and topic that is presented each time to the learners. More information regarding the allocation of innovative techniques across the different modules and learning units is depicted by the corresponding tables.

Table 1: Techniques and their application to RELIEF Modules

<p>Agricultural sustainability, management of natural resources and climate action</p> <ul style="list-style-type: none"> ● PechaKucha ● Flipped classroom ● Critical Thinking Mindset ● Moving towards a growth mindset 	<p>Digital technologies and artificial intelligence</p> <ul style="list-style-type: none"> ● PechaKucha ● Flipped classroom ● Critical Thinking Mindset
<p>Bio-economy, circular economy and bio-based products</p> <ul style="list-style-type: none"> ● PechaKucha ● Flipped classroom ● Critical Thinking Mindset ● Systems Thinking: The Iceberg Model ● Moving towards a growth mindset 	<p>Controlled environment agriculture</p> <ul style="list-style-type: none"> ● PechaKucha ● Flipped classroom ● Critical Thinking Mindset
<p>Horizontal</p> <ul style="list-style-type: none"> ● PechaKucha ● Flipped classroom ● Critical Thinking Mindset ● Systems Thinking: The Iceberg Model ● Moving towards a growth mindset ● World Café 	

Table 2: Relevant technique per learning unit

Technique	Relevant learning unit
PechaKucha	<ul style="list-style-type: none"> All learning units
Flipped classroom	<ul style="list-style-type: none"> All learning units
Critical Thinking Mindset	<ul style="list-style-type: none"> All learning units
Systems Thinking: The Iceberg Model	Climate change (HEI-A2) Understanding climate change (VET-A2) Water, Energy, and Food (WEF) Nexus security, Drip Irrigation, and Desalination (HEI-A3) Water, Energy, and Food (WEF) Nexus security, Drip Irrigation, and Desalination (VET-A3) Circular Economy (HEI-C1) Circular Economy (VET-C1)
Moving towards a growth mindset	LU1: Renewable energy and its application as green agricultural energy source LU2: Climate Change LU3: Water, Energy, and Food (WEF) Nexus security, Drip Irrigation, and Desalination LU4: Agricultural reuse of organic residuals LU9: Circular Economy LU10: The concept of biorefinery LU 11: Bioenergy and energy crops LU17: Soft Skills LU18: Green Skills LU19: Entrepreneurial Skills LU20: Digital Skills
World Café	LU17: Soft Skills LU18: Green Skills LU19: Entrepreneurial Skills LU20: Digital Skills

3.3 Alternative Techniques

3.3.1 PechaKucha

Description of technique

The PechaKucha technique is a dynamic presentation approach originating from Japan, known for its succinct and visually captivating style. In a PechaKucha presentation, speakers deliver their ideas or stories in a precisely timed format: 20 slides, each displayed for 20 seconds, resulting in a concise and engaging 6-minute and 40-second talk. Visuals take center stage, with each slide featuring a striking image or minimal text, enhancing the speaker's narrative. This format encourages a

seamless and engaging flow of ideas, making it suitable for a wide range of topics, from personal anecdotes to professional insights. Often featuring multiple presenters, PechaKucha events create a fast-paced and diverse atmosphere, making it an excellent tool for conveying information, sparking discussions, and fostering creativity in various settings, including conferences, workshops, and informal gatherings.

In which sector it is usually applied

- Entrepreneurship

How it is connected with RELIEF - Learning pathway and pedagogy

Learning pathway: face to face

Pedagogy: active learning, experiential learning

Duration

6 minutes 40 seconds per presentation.

Number of participants

5-20

Detailed instructions for implementation

1. Introduction to PechaKucha: Start by explaining the concept of PechaKucha to your students. Describe the format, including the 20 slides, 20 seconds per slide, and the total duration of 6 minutes and 40 seconds.
2. Select Topics: Have students choose topics that align with the course content, projects, or areas of interest.
3. Create Presentation Content and slides: Emphasize the importance of concise, visually engaging content. Students should create slides that contain a single image or minimal text.
4. Practice: Encourage students to rehearse their presentations multiple times to ensure they can effectively convey their message within the time constraints.
5. Presentation: On the presentation day, set up a space where each student can present their PechaKucha. Ensure that the timing is strict, with each student having exactly 6 minutes and 40 seconds.
6. Q&A and Feedback: After each presentation, allow for a brief question-and-answer session to encourage discussion and clarification. Also, provide feedback on each presentation, highlighting strengths and areas for improvement.

Owners of these techniques and contact details

The origins of PechaKucha begin in Tokyo, Japan, where architects Astrid Klein and Mark Dytham created the format in 2003

Contact: info@klein-dytham.com

Supportive materials and further reading

- Setting up a pecha kucha session is relatively simple and requires minimal resources other than active participation, student preparation, an adequate space, computer and projector.
- <https://www.pechakucha.com/about>
- <https://www.masterclass.com/articles/pechakucha-explained>
- Tutorial on how to make pechakucha presentations
https://www.youtube.com/watch?v=4XTO8nk_L3c&ab_channel=PechaKucha20x20

3.3.2 Flipped classroom

Description of technique

The Flipped Classroom is an innovative teaching method that reverses the traditional approach to learning. In this technique, instructional content is delivered to students outside of the classroom, typically through pre-recorded videos or online materials. Students are then expected to engage with this content independently at their own pace before attending the physical class session. During the in-person class time, the focus shifts from lecturing to interactive activities, collaborative discussions, and practical application of concepts. This approach encourages active learning and allows educators to provide personalized attention to students' needs. The concept of the Flipped Classroom was developed by two chemistry teachers, Jonathan Bergmann and Aaron Sams, who began recording their lectures in 2007 to help absent students catch up on missed content. Over time, they realized the potential of this approach and formalized the Flipped Classroom teaching method.

In which sector it is usually applied

- Education: it is widely used in schools, universities, and other educational institutions to enhance student engagement and promote a deeper understanding of subject matter.
- Professional Development: the technique can be utilized for training programs and workshops to encourage continuous learning and skill development among professionals.

How it is connected with RELIEF - Learning pathway and pedagogy

This technique can be applied to some RELIEF learning units where material developed to convey theoretical notions is available (videos, presentations, texts). These materials can be offered to

students for individual study and discussed in class through structured activities or hands-on experiments.

Learning Pathway: face to face, and online learning

Pedagogy: active learning, collaborative learning

Duration

Pre-recorded lectures of 5-15 minutes (it is recommended not to exceed 15 minutes), discussion 45 minutes

Number of participants

5-20 (the entire classroom)

Detailed instructions for implementation

1. Planning the flipped classroom: defining the content scope, learning objectives and lesson plan.
2. Content preparation: teachers create video lectures, online readings or other multimedia materials covering the main topics to be studied.
3. Independent learning: students access these materials outside the classroom, allowing them to study at their own pace and review concepts as needed.
4. Classroom activities: during class time, educators, after introducing the task and objectives, focus on interactive activities such as group discussions, problem-solving exercises, practical experiments and debates related to the previously studied content. Group discussion is the most frequent activity in flipped classes; it can also be organised in subgroups that then come together to discuss with the whole classroom.
5. Personalised support: teachers assist and guide students who need extra help or have specific questions, promoting personalised learning experiences.
6. Evaluation: at the end of the flipped classroom evaluate the work (also with students). What worked well? What would you change?

Owners of these techniques and contact details

Various people have helped develop this technique. Dr. Erik Mazur, Maureen J. Lage (lagenrj@niuohio.edu) and J. Wesley Baker have all been credited with contributing to its development.

Supportive materials and further reading

Practical guide for implementing a flipped classroom: https://ec.europa.eu/programmes/erasmus-plus/project-result-content/17061004-3280-44bc-81ca-463b3f329b5d/Flipped_Classrom_in_Practice_EN.pdf

Video lectures and online readings, Interactive quizzes and assessments, hands-on projects and assignments.

3.3.3 Critical Thinking Mindset

Description of technique

The Critical Thinking Mindset is a cognitive approach that emphasizes analytical, rational, and reflective thinking to assess and interpret information objectively. It involves challenging assumptions, collecting data, considering multiple perspectives, evaluating evidence, and drawing well-informed conclusions. Embracing a Critical Thinking Mindset enables individuals to navigate complexities, solve problems, and make informed decisions in a deliberate and thoughtful manner.

In which sector it is usually applied

In Education, to develop students' problem-solving abilities, but also in Business and Management, Scientific Research, Media and Communication.

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How it is connected with RELIEF - Learning pathway and pedagogy

By adopting a Critical Thinking Mindset in the context of bioeconomy, one can effectively address challenges, make informed decisions and understand interconnections between elements of a complex system.

Learning pathway: face to face, work based learning, e-learning

Pedagogy: problem based learning

Duration: 30 - 60 minutes

Number of participants: 2 - 10 participants

Detailed instructions for implementation

Organise a group activity following the instructions, steps and guiding questions (adapting them if necessary) provided in the Hyper Island toolkit (<https://toolbox.hyperisland.com/critical-thinking-mindset>), these are included below:

Step 1:

Select a subject for your critical thinking analysis.

Step 2:

Within Annex 1, you will discover a set of broad and adaptable Critical Thinking Questions that can be applied to your chosen subject. This collection of questions serves as a toolkit for evaluating information and ideas related to your topic. You can choose to record your questions and responses using traditional pen and paper or opt for digital means if you prefer.

Step 3:

Embracing a critical thinking mindset entails the capacity for thoughtful and autonomous contemplation. Essentially, critical thinking hinges on your aptitude for rational reasoning. It entails active engagement in the learning process rather than passively receiving information.

Critical thinkers don't merely accept ideas and assumptions at face value; instead, they scrutinize them. They strive to ascertain whether these concepts, arguments, and findings present a comprehensive perspective and remain open to exploring any gaps or shortcomings.

Critical thinkers approach problem-solving systematically, relying on methodical analysis rather than solely relying on intuition or instinct.

The topics to be brought in the assessment of critical thinking must be carefully chosen in accordance with the objectives of the RELIEF learning units (for instance, what is the relationship between bioeconomy and sustainability).

Owners of these techniques and contact details

Specific development cannot be attributed to a single individual. The intellectual roots of critical thinking are as ancient as its etymology, traceable, ultimately, to the teaching practice and vision of Socrates 2,500 years ago.

Supportive materials and further reading

Annex 1: Critical Thinking Questions

Videos, quizzes (e.g., <https://www.bioeconomy-library.eu/bio-challenge/>, <https://www.fvaweb.eu/bes/>), case study to analyse. Some resources can be found here: https://www.bioeconomy-library.eu/list-of-contents/?sft_category=bioeconomy-education

3.3.4 Systems Thinking: The Iceberg Model

Description of technique

The Iceberg Model is a Systems Thinking tool used to understand complex systems by visualizing the underlying structures and behaviours that influence a particular situation or issue. It draws an analogy to an iceberg, where the visible tip represents the easily observable aspects of a system, while the larger, submerged portion symbolizes the deeper, less apparent elements. By employing the Iceberg Model, individuals can gain a holistic perspective of a system, identifying both the visible and underlying factors that contribute to its behaviour and outcomes.

In which sector it is usually applied

In economics, business management, social sciences, environmental studies, global issues (e.g., climate change), in the healthcare sector.

How it is connected with RELIEF - Learning pathway and pedagogy

The activity could be used to describe complex system such as climate system, circular economy, bioeconomy or applied to the horizontal modules dedicated to the development of soft and green skills because it helps to think in systems and analyse complex dynamics also from the point of view of citizens and consumers (references: <https://www.sciencedirect.com/science/article/pii/S2214804321000926>).

Learning pathway: face to face, online learning

Pedagogy: transformative learning

Duration: 30 - 120 minutes

Number of participants: 2-40+

Detailed instructions for implementation

A workshop can be organized using a poster with the iceberg drawn, the event to be analyzed is selected and the learners contribute to building all the layers. Examples of topics that can be addressed: analyze the transformations of society with respect to issues of social, environmental and economic sustainability.

See this example: https://www.researchgate.net/figure/The-iceberg-model-four-levels-of-a-system-based-on-Meadows-2008-Maani-and-Cavana_fig2_350492311

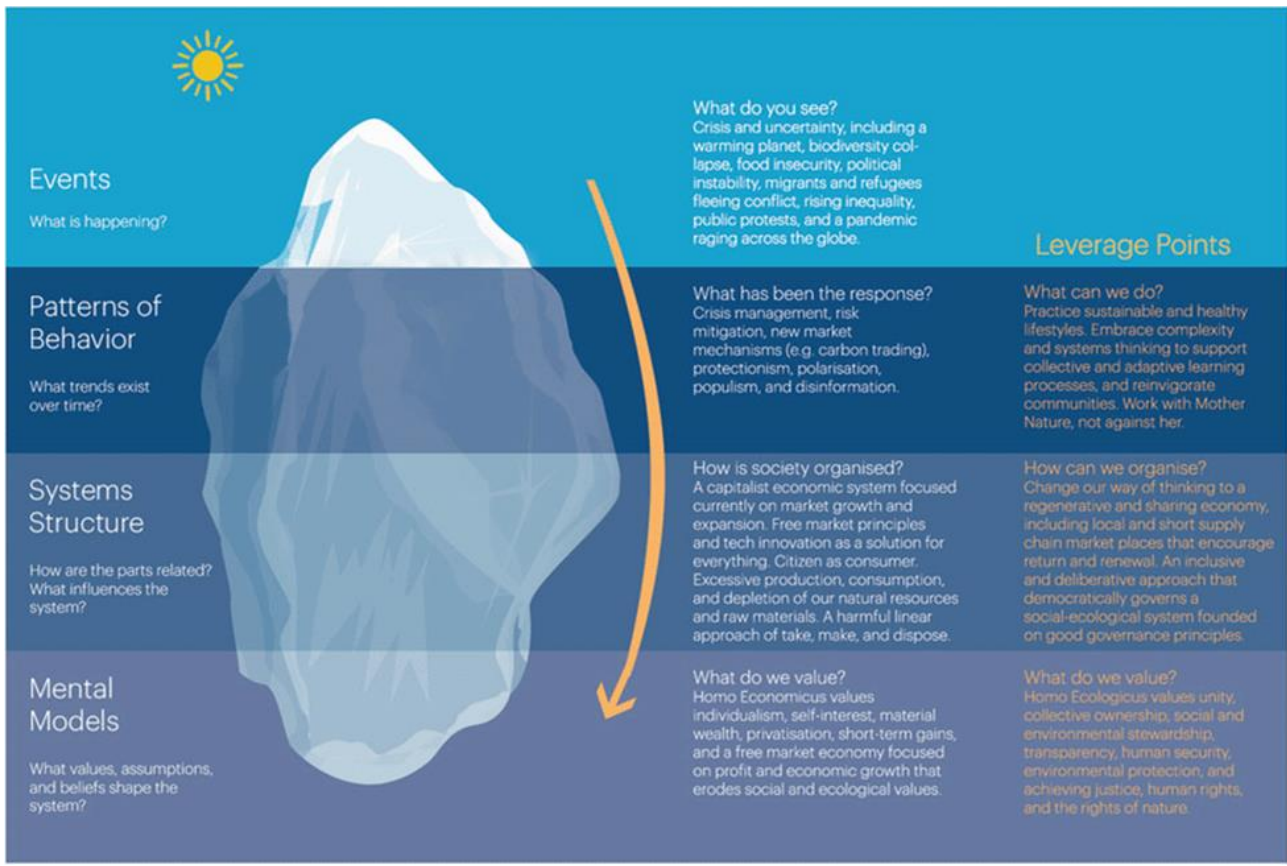


Figure 7 Conceptual Background of Transformative Social-Ecological Innovation - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/The-iceberg-model-four-levels-of-a-system-based-on-Meadows-2008-Maani-and-Cavana_fig2_350492311 [accessed 26 Jul, 2023]

Step 1:

Introduction

One systems thinking model that is helpful for understanding both global and local issues is the iceberg model. We know that an iceberg has only 10 percent of its total mass above the water while 90 percent is underwater. But that 90 percent is what the ocean currents act on, and what creates the iceberg’s behavior at its tip. Global and local issues can be viewed in this same way.

LEVELS OF THINKING

- 1. The Event Level** The event level is the level at which we typically perceive the world—for instance, waking up one morning to find we have caught a cold. While problems observed at the event level can often be addressed with a simple readjustment, the iceberg model pushes us not to assume that every issue can be solved by simply treating the symptom or adjusting at the event level.
- 2. The Pattern Level** If we look just below the event level, we often notice patterns. Similar events have been taking place over time — we may have been catching more colds when we haven’t been resting enough. Observing patterns allows us to forecast and forestall events.

3. The Structure Level Below the pattern level lies the structure level. When we ask, “What is causing the pattern we are observing?” The answer is usually some kind of structure. Increased stress at work due to the new promotion policy, the habit of eating poorly when under stress, or the inconvenient location of healthy food sources could all be structures at play in our catching a cold. According to Professor John Gerber, structures can include the following:

- Physical things — like vending machines, roads, traffic lights or terrain.
- Organizations — like corporations, governments, and schools.
- Policies — like laws, regulations, and tax structures.
- Ritual — habitual behaviors so ingrained that they are not conscious.

4. The Mental Model Level Mental models are the attitudes, beliefs, morals, expectations, and values that allow structures to continue functioning as they are. These are the beliefs that we often learn subconsciously from our society or family and are likely unaware of. Mental models that could be involved in us catching a cold could include: a belief that career is deeply important to our identity, that healthy food is too expensive, or that rest is for the unmotivated.

Step 2:

PUTTING THE LEVELS TOGETHER

Take a look at the [diagram attached](#) to see the Iceberg Model applied to an instance of catching a cold.

GIVE IT A TRY!

Select a recent event that strikes you as urgent, important or interesting. Some examples include a recent weather event, the pandemic, a controversial court decision or a high profile court case; a local policy change or contentious issue; recent military action between nations; or an issue you’ve personally encountered recently.

Write the event (what is observable about the event) at the top of the iceberg (you might draw an iceberg/triangle) and work your way down through the patterns, underlying systems and mental models, adding as many as you can think of.

It can also be useful to move up and down between levels as you think more about the event.

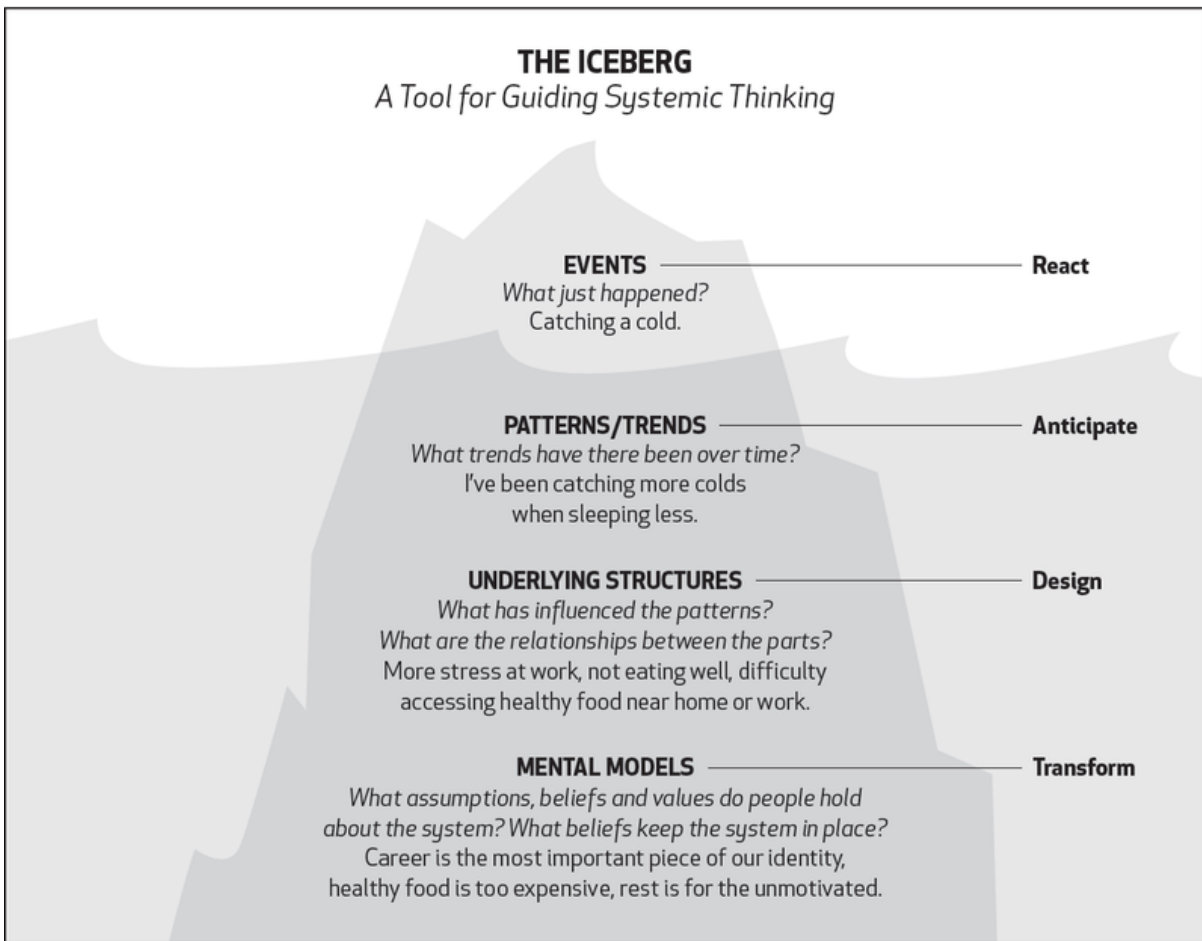


Figure 8. Explanation of the Iceberg Model

Step 3:

QUESTIONS TO CONSIDER AFTER TRYING OUT THE ICEBERG MODEL

Does the iceberg model help broaden your perspective? If so, how might this new perspective be helpful?

Consider the concept of entry, or “leverage” points. These are points at which to intervene in a system that could lead to systemic transformation.

Does the exercise show you any new entry points at which you are inspired to intervene?

What issues that have frustrated you might be interesting to analyze with the Iceberg Model?

What else?

ACTION STEPS Is there action to take? Consider the Who/What/When Matrix to connect people with clear actions on tasks and a commitment on when they will complete the task.

The activity is described in detail here <https://toolbox.hyperisland.com/a-systems-thinking-model-the-iceberg> and here <https://ecochallenge.org/iceberg-model/>.

Owners of these techniques and contact details

The Iceberg Model has been widely adopted in the field of Systems Thinking, but its specific origin and development cannot be attributed to a single individual, the method and tool proposed here are curated by Hyper Island <https://toolbox.hyperisland.com/> and Ecochallenge <https://ecochallenge.org/iceberg-model>.

Supportive materials and further reading

Provide articles, books, or research papers, videos and presentations to illustrate real-life applications of the Iceberg Model and its effectiveness in addressing complex problems.

Worksheets and templates: Offer worksheets or templates that guide learners in applying the Iceberg Model to different situations, helping them practise the technique.

Online tools: Utilize interactive online tools or software that enable learners to create and share visual representations of systems using the Iceberg Model (e.g., Miro and other collaborative platforms). Some resources can be found here: https://www.bioeconomy-library.eu/list-of-contents/?_sft_category=bioeconomy-education

3.3.5 Moving towards a Growth Mindset

Description of technique

This technique that was developed by Carol Dweck introduces the terms of “Fixed mindset” and “Growth mindset” in order to describe the beliefs and thoughts that people have about their intelligence and the related abilities. More specifically, people with “Fixed mindsets” tend to believe that one’s intelligence, beliefs and abilities are stable and cannot change and/or further develop. On the contrary, people with a “Growth mindset” believe that human qualities can be improved through effort and in this sense daily challenges and obstacles constitute natural key sources of learning. Moreover, people with fixed mindsets tend to avoid challenges due to their fear of failure and their “inability” to overcome a potential barrier, whilst those with a growth mindset are motivated to learn more from difficulties and are encouraged to work hard in order to overcome any challenges they might face. On the basis of these, this technique is designed to help people move towards a growth mindset by noticing fixed mindset elements in oneself and then actively adopting growth-oriented actions.

In which sector it is usually applied

- Psychology
- Career counselling

Owner of the Technique:

This intervention was adapted from Carol Dweck's website by Lucinda Poole.

Contact details:

Address: Gandhiplein 16, 6229HN Maastricht, The Netherlands

E-mail address: info@positivepsychology.com

Website of the organisation that has adapted the intervention : <https://positivepsychology.com/>

How it is connected with RELIEF - Learning pathway and pedagogy

Starting point of the technique is the fact that people rely on their fixed mindsets, which in turn leads to remain in beliefs about their intelligence and abilities that discourage them from learning new things since they do not believe that they will manage to do it, preventing in this way, their personal and professional development. The foundation of this technique is similar to the experience that many farmers may have with a view to new regulations and policies, for changing their mindsets along with their practices through the integration of bioeconomy. Therefore, this innovative technique could be implemented in the following modules:

- Module 1: Agricultural sustainability, management of natural resources and climate action
- Module 3: Bio-economy, circular economy and bio-based products
- Module 5: Horizontal Skills

It is worth mentioning that this technique falls under the category of **active-based learning** and **transformative learning** and therefore, it could be implemented either face to face or through Work based learning (WBL).

Duration 5 min/ day

Number of participants: 1-20 in individual sessions

Detailed instructions for implementation

There are 4 steps that will enable learners to move from a fixed mindset towards a growth one.

Step 1: Learn to hear your mindset “voice”

The 1st step leads the learners to identify a problem and interpret their thoughts about it. Therefore, they have to write down a difficult situation that they had experienced the current week along with the feelings and thoughts about themselves that this situation has triggered. They have to fill in the columns 1 and 2 from the Mindset log (Annex 2).

Step 2: Identify whether these thoughts represent a fixed or growth mindset

Based on the explanation of what constitutes a fixed and growth mindset, encourage the learners to decide whether their thoughts/ feelings related to the situation they have previously described fall under which of the two categories, by filling the 3rd column of the Mindset log (Annex 2).

Notice: Expressions like “I’m not good enough”, “I’m not smart enough,” and “I failed last time, so I will probably fail again” are typical thoughts of a fixed mindset.

Step 3: Realize your power to choose

When learners realize their attitudes and perceptions then they have the ability to choose to have a different reaction in similar situations. So, if they notice a fixed mindset commentary, then they are able to choose whether to continue with this mindset or to shift to a growth-oriented one. For this to be achieved, they have to respond to their fixed mindset commentary with a growth mindset commentary, which they will fill in the 4th column of the Mindset log (Annex 2).

Examples of growth mindset commentaries: “I am having difficulty with this task, but I can learn to master it with time and effort,” “Most successful people have experienced failures along the way,” “The harder I try, the more likely I will be to succeed”

Step 4: Act in line with your growth mindset

Now that learners have shifted to growth mindset declarations, they will have to proceed with the identification of the corresponding actions. For instance, a growth mindset leads to actions like approaching challenges and obstacles with enthusiasm and curiosity, interpreting failures as learning opportunities, learning from setbacks and trying again, and receiving criticism with an open mind. So, ask them to list one or more actions that reflect a growth mindset in the 5th column of the Mindset log (Annex 2). You should notify learners that this process will be a little complex in the beginning. But the more they practise it, then the more natural it becomes.

Supportive materials and further reading

Annex 2: Mindset Log

<https://www.personatalent.com/productivity/how-to-cultivate-a-growth-mindset>

Moser, J. S., Schroder, H. S., Heeter, C., Moran, T. P., & Lee, Y.-H. (2011). Mind your errors: Evidence for a neural mechanism linking growth mind-set to adaptive posterror adjustments. *Psychological Science*, 22, 1484–1489. <https://doi.org/10.1177/0956797611419520>

3.3.6 World Café

Description of technique

This process called the World Café, creates a special relaxed, café-like setting with small, preferably round tables. Participants engage in rounds of 20-minute conversations at these tables, guided by specific questions. Insights and results from these discussions are shared with the larger group, often visually represented for collective understanding.

In which sector it is usually applied

All sectors

How it is connected with RELIEF - Learning pathway and pedagogy

It fosters collaboration and creative thinking and enhances problem solving skills. This process can be used i.e. in HE classes after presenting real-life scenarios (case studies) or a specific technique in agriculture in which students can then discuss the pros and cons of the case or technique. More importantly, it can enhance the soft skills learning units of HE and VET training that include Interpersonal communication, Effective communication, Building Effective Teams, Teamwork and collaboration skills, Decision-making and problem-solving, The importance of Resilience and Adaptability in transition to change, and The basic principles of Accountability and Ethical behaviour.

Owner of the Technique:

Juanita Brown and David Isaacs

Contact details:

Juanita Brown. Phone: 828/682-9108 Email: juanita@theworldcafe.com

Address: The World Café Community Foundation, 336 Bon Air Center, Suite 149, Greenbrae CA 94904

Learning pathway: face to face, online learning

Pedagogy: Conversational leadership, transformative learning, collaborative learning

Duration: 20 minutes

Number of participants: 4-5 participants depending on the size of each table and as many tables a room can accommodate.

Detailed instructions for implementation:

Step 1:

Arrange the setting: Establish a distinctive environment, typically resembling a café with small round tables covered with checkered or white linen tablecloths, butcher block paper, coloured pens, a

vase of flowers (optional), and an optional "talking stick" item. Ensure each table accommodates four chairs optimally, but no more than five.

Step 2:

Welcome and Introduction: Initiate the session with a warm welcome, introducing the World Café process, providing context, explaining Café Etiquette, and putting participants at ease.

Step 3:

Small-Group Rounds: The activity kicks off with the first of three or more twenty-minute chats for small groups of four (or a maximum of five) people sitting around a table. After those twenty minutes, everyone in the group switches to a different table. Some may decide to keep one person as the "table host" for the next round. This host welcomes the new group and gives them a quick update on what went on in the last round.

Step 4:

Questions: Introduce each round with a meticulously crafted question tailored to the specific context and intended purpose of the World Café. These questions can be reused across rounds or progressively built upon to channel and guide the conversation.

Step 5:

Harvest: Post small-group discussions (and/or during intervals between rounds, as necessary), encourage individuals to share insights or outcomes with the larger group. These outcomes are visually represented, often through graphic recording at the front of the room.

Supportive materials and further reading

<https://theworldcafe.com/>

PART C: Assessment Methodology and Monitoring

4.1 Assessment

4.1.1. Definition and Importance

The term “Assessment” refers to “*the systematic process of gathering, interpreting and acting upon data related to student learning and experience or the purpose of developing a deep understanding of what students know, understand, and can do their knowledge as a result of their educational experience*” (Huba & Freed, 2000). In fact, assessment constitutes an ongoing process that aims in deeply understanding and improving the learners’ learning. However, it would be false to think that it is all about collecting data. On the contrary, assessment refers to combination of three key factors: **a) Cognition**, that refers to how students represent knowledge and develop competence in a content domain; **b) Observation**, that presents the tasks or situations that allow one to observe the learners’ performance; and **c) Interpretation**, which is used for drawing inferences from performance evidence (National Research Council (2001).

In other words, assessment identifies:

- What the learners have learnt in terms of Knowledge
- What the learners can do and the extent to which they can perform well in terms of skills
- How the learners proceed with carrying out their practical activities/ assignments / tasks in terms of the learning process
- How the learners feel about their activities/ assignments / tasks in terms of motivation and effort

Apart from these, assessment contributes significantly to the design and modification of training programs by promoting learners' learning and success. At the same time, assessment sets the foundations for standardizing their abilities. This in turn, enables those actively involved in the design and delivery of training programs to act more coherently and effectively in promoting the learning of learners. Last but not least, through the assessment learners have the opportunity to receive feedback about their performance, which encourages them to seek improved results by better planning of their learning experience, within the framework of RELIEF training course.

4.1.2 Key Principles and Values

As it derives from above, assessment does not constitute the end of the learning process but more of a vehicle for educational improvement. For this to be achieved, it is crucial to be designed from

the very beginning, along with the training program design. According to Kasworm and Marienau (1997), there are **five key principles** that need to be followed in order to shape “assessment systems and strategies, for guiding authentic, relevant, and effective assessment of adult learning efforts”.

More specifically, **Learning**:

- **Derives from various learning sources**, in a sense that learning occurs from interaction with a wide variety of informal and formal knowledge sources.
- **Engages the whole person** contributing to the person’s development through the reinforcement of the person’s cognitive, conative, and affective domains of learning.
- **Is promoted (along with Self-direction) through feedback**, which in turn leads to the learner’s active involvement not only in learning but also in the assessment processes, assisting the learning process.
- **Occurs in context** which in turn leads to having impact in the broader environment of learners, like work, family, and community.
- **Deploys experiences** that accommodate different learning styles that are founded upon different life experiences and educational backgrounds.

In addition to this, the assessments of training programs should determine specific criteria that make explicit to learners what they have to achieve and the extent to which they have achieved it. Therefore, quality criteria need to be established, ensuring the effectiveness and efficiency of the assessment process (Tillema et al, 2011; Collins, 2013; Race, 2014):

- **Validity** - refers to the accuracy of assessment, which entails the appropriateness of the process for its purpose, whilst assessing what is wanted to be measured (Learning outcomes)
- **Reliability** – the assessment method or instrument measures consistently the performance of a learner, thus in case of repetition the same results shall be received
- **Effectivity** – the assessment method should evoke the desired learning behaviour of learners
- **Fairness**- all learners should have equal opportunities to demonstrate the relevant

knowledge, skills, and competencies under appraisal

- **Transparency**- tasks need to be clear, understandable, and do-able for those who have to complete them
- **Feasibility**- determines how feasible is for the designed assessment to be administered
- **Authenticity**- the assessment should be in alignment with the knowledge, skills and competences of the learners allowing measuring performance within real life contexts

4.1.3. Types of Assessment

Assessment can be diagnostic, summative, or formative, depending on its objectives.

A diagnostic assessment provides an indicator of a learner's aptitude and preparedness for a unit or program of study and identifies possible learning problems (Bejar, 1984). A diagnostic assessment is essential when constructivism is adopted, in which learners' previous experiences and knowledge are important and should be accounted for. Diagnostic assessment typically takes place at the beginning of a teaching or training sequence, usually in the form of a short quiz/test, or single question(s). Especially for adult learners, when they first enter a new program, a diagnostic assessment may be performed, to identify their strengths and any potential barriers to learning (such as a disability), and to direct them to the most appropriate module to study according to their needs and expectations.

In order to evaluate if the learners/ trainees understood the contents and are able to apply the newly acquired knowledge, it is recommended to include assessment activities at least at the end of each learning unit, for summative (final) assessment purposes.

Summative assessment is when the learners' status with respect to educational variables of interest is determined (Popham, 1999). Summative assessment informs the learners of the standard that they have achieved, can provide insights into whether the course is effectively reaching its aims, certify to third parties (e.g., employers) the level of knowledge that each learner has reached, and make decisions about learners' eligibility for further courses (Freeman, 2005). Thus, summative assessment typically takes place at the end of a teaching or training sequence, in the form of exams/tests/quizzes, tutor-marked assignments, computer-marked assignments, course work, etc. since it is regarded more as a formal type of assessment.

Assessment becomes formative when the information is used to adapt teaching and learning to meet student needs.

Formative assessment can be defined as *"the process used by teachers and students to recognize and respond to student learning in order to enhance that learning, during the learning process"* (Bell & Cowie, 2001, p. 1). In this respect, formative assessment involves the collection of evidence about learners' current state of learning and results in the provision of continuous feedback for both the learner and the educator. Formative assessment has come to receive much recognition as a powerful means of enhancing learners' learning (Black & Wiliam, 2009). Different formative assessment methods have been introduced in the literature, such as interactions-on-the-fly, educator's written feedback, peer feedback and peer assessment, self-assessment, while formative assessment activities may be applied for different learning objects, such as learners' responses to in-text questions, e-portfolios, projects, assignments, etc.

It should be noted that there are numerous distinctions of assessment categories. Within the framework of RELIEF it is useful to highlight the critical role of **Self-assessment** in the effectiveness of the learning process. Based on Dochy et al (1999), it refers *“to the involvement of learners in making judgements about their own learning, particularly about their achievements and the outcomes of their learning”* constituting a key mean for activating their role in their own learning.

In addition, there is a distinction between **“assessment of learning**, which refers to the assessment conducted for the purposes of **grading and reporting** with its own established procedures, and **assessment for learning** which purpose is to enable **students**, through effective feedback, to fully understand their **own learning and the goals they are aiming for** (Elwood & Klenowski, 2002). The concept of **“assessment for learning”** places the learner and learning in the centre for the assessment as an instructional practice (Vonderwell, Liang, & Alderman, 2007). The RELIEF training methodology embraces a learner-centred approach; thus a significant emphasis will be given to assessment for learning, in which learners share the ownership and responsibility for assessing their own performance and learning outcomes. Learner centred assessment can encourage meaningful dialogue, increase collaboration, peer and self-evaluation, and sense of community for a shared purpose (Morgan & o’Reilly, 2001).

4.2 Monitoring

4.2.1 Definition and Scope

Monitoring goes hand in hand with assessment. In fact, it constitutes an integral part of it. Through monitoring the trainer and/or training providers have the ability to check whether the training achieves all these that it was designed for in the first place. In other words, it highlights the progress of the learners during the learning process. The term is used to describe *“the continuous and systematic assessment of project implementation based on targets set and activities planned during the planning phases of the work and the use of inputs, infrastructure, and services by project beneficiaries”* (Minhaz, nd). Monitoring involves observing the progress of different components of any given program in order to identify barriers and bottlenecks, so that timely corrective measures can be taken (Davies, 2003). Furthermore, **Monitoring**:

- Is a **continuous** process
- Focuses on **inputs, activities, outputs, implementation processes**, continued relevance, likely results at outcome level

- Foresees **tracking, oversighting, analysis, and documentation** of progress
- Provides answers to what **activities** were implemented and the **results** achieved
- Alerts trainers/educators for potential problems allowing them to undertake **corrective measures**

4.2.2. Aspects of monitoring in RELIEF

Within the framework of RELIEF different aspects will be monitored, that will indicate how the training is perceived by learners and whether corrective measures/ modifications / adjustments need to be taken so as to engage learners in the learning process, hence facilitating the achievement of the desired outcomes.

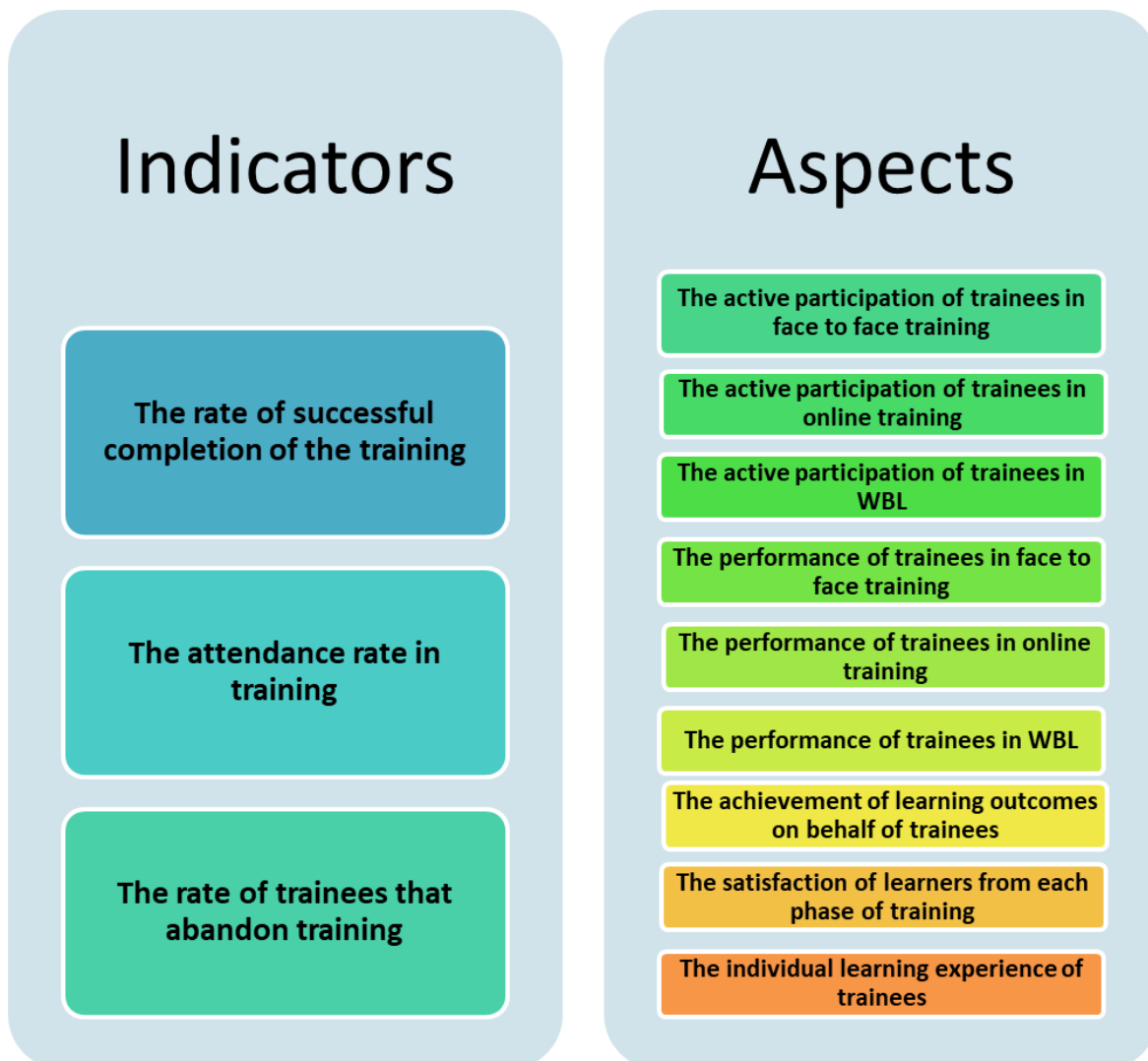


Figure 10. Aspects and Indicators for monitoring the RELIEF project

4.3 Recommended Monitoring and Training Assessment Methodologies and techniques

Following the outlined theoretical approach and justification presented in the RELIEF Training Methodology, emphasis is given in the interchange among different assessment types. A continuum between 'formative' (supporting learning) and 'summative' (measuring achievement) assessment is foreseen, through a mix of tasks that seek to achieve the diverse goals and to recognise the different achievements of learners. For this to be achieved, assessment involves not only those who assess learners' work (staff, peers and stakeholders) but also the learners themselves, in order to enhance their mindset on pursuing an autonomous and self-regulated learning (Taylor, 2009). Moreover, following the constructivist approach as the base of the RELIEF Theoretical approach, emphasis is given on the critical role of the assessment for learning (formative and self-assessment) rather than assessment of learning (summative assessment). In line with this, RELIEF training aims to follow a learner-centred approach supporting the self-assessment evaluation by the learners alone since this will allow them to reflect on their own performance and motivate them further. In addition, the RELIEF identified learning outcomes will act as a key mean for measuring the performance of learners constituting the predefined criteria for assessing the effects of training on the learners in terms of knowledge, skills, and competences.

A combination of formative assessment and self-assessment is applied throughout the learning procedure and to all phases of training, face-to-face, e-learning, and WBL and has a cumulative use. Summative assessment will be implemented at the end of the training.

The details of the assessment methodology applied in each phase of training are presented in the following sections.

4.3.1 Face-to-Face Learning

To effectively assess face-to-face training, a combination of assessment methods is employed. The techniques/tools have been selected for their compatibility with the constructivism approach and adult education principles, and include formative and summative assessment, as well as self-assessment and assessment for learning. The selection of the assessment method depends on the learning outcomes, content and training techniques used in each module/learning unit. The training providers as well as the trainers/educators can select the appropriate tools based on the characteristics and the purposes of the assessment.

4.3.1.1 Recommended Techniques

The appropriate techniques used for face to face learning is dependent on the learning unit and style of the educator. A large number of techniques are available and well-documented but those recommended for RELIEF training are the following:

- ✓ **Case study:** Case studies are popular tools used for both formative and summative assessment as well as self-assessment. They depict real-life situations in which problems need to be solved. They are commonly used methods of problem-based learning. Typically, using these methods, trainers/educators aim to develop student reasoning, problem-solving and decision-making skills (UNSW, nd). Learners are introduced to a real or fictional case study, either as individuals or in groups, and they are asked to identify a set of problems, and subsequently apply their knowledge of the subject to the case. Case studies are a powerful learning tool for developing cognitive skills of students; whilst they reach their highest effectiveness as a teaching and assessment tool when they are authentic; ensuring that case studies accurately reflect the circumstances in which a learner will eventually be practising professionally can require a considerable amount of research, as well as the potential involvement of industry professionals (UNSW, nd).
- ✓ **Group/teamwork** allows for the employment of different skills, knowledge and experiences that individuals have. It can be approached both as a skill to be learned and as a means of carrying forward curriculum concerns and of enriching classroom experience.
- ✓ **Portfolio:** A purposeful collection of work samples of annotated and validated pieces of evidence, compiled by the learner. Evidence could include written document, photographs, videos or logbooks (ASQA, 2015). They can be used both as a record of learners' development in a number of areas, as well as a means of summative assessment. Portfolios can contain evidence reflecting a wide range of skills and attitudes indicating in this way progress and development.
- ✓ **Presentation:** It is often used to assess students' learning in individual or group projects. It is the process of showing and explaining a topic to an audience. Presentation assessment usually consists of a topic for the student to research, discuss and present. Questions and answers are usually following the presentation.
- ✓ **Role play:** it is considered as a form of experiential learning. Students learn through their exploration as they are provided with opportunities for learning situated in a real life context through simulating the activities of their profession. Role playing significantly contributes to learning and assessment as it provides opportunities to reflect on learning, to show how tacit knowledge works etc. At a culminating academic moment (such as the end of a learning unit) a role play can take the form of an exhibition or demonstration and can serve as a summative assessment tool.
- ✓ **Observations/ checklists:** It is used for formative assessment purposes, and it involves the monitoring of behaviours, the engagement of learners, participation, and understanding throughout the training, providing feedback and adjusting the content and delivery as

necessary (Clark, 2012). Moreover, they constitute a flexible approach which can result in the acquisition of multiple qualitative and quantitative data, whilst they can be applied in various contexts (Evaluation Resource Hub, 2021).

- ✓ **Discussion.** This activity can be a valuable source of formative assessment and monitoring, since it enables the program to be adjusted, if necessary. It supports the learner-centred approach where learners are encouraged to critically reflect upon training and express their opinions (Chaplowe & Cousins, 2015).
- ✓ **Self-Assessment and Reflection:** Encourage participants to reflect on their learning experience, identifying strengths, areas for improvement, and plans for future growth in the agribusiness environment.
- ✓ **Peer assessment:** This approach to assessment supports collaborative learning, reflection and feedback. It can be structured into training activities as long as clear and predetermined criteria have been set and agreed upon all stakeholders prior to the implementation of the activities. Feedback can be provided orally through discussion and guided with forms or checklists (Chaplowe & Cousins, 2015).

4.3.2 Work based Learning

Assessment plays a pivotal role in Work-based learning (WBL) since it illustrates the practical and experiential learning that learners received in terms of skills and competences, which is fully aligned with the acquired knowledge during the training delivery. The key features of WBL, in general provide learners with valuable opportunities to apply academic concepts in practical settings, develop professional skills, and establish connections with industry professionals. Through the integration of real-world work contexts and challenges in the learning experience, promotes active, experiential and collaborative learning opportunities to learners, which in turn enhances the application of theoretical knowledge to practical work situations.

Within the framework of RELIEF, WBL assessment will be formative and summative, based on data collected from trainees themselves and trainers/educators. Monitoring will be ongoing, while self-assessment and self-monitoring will be also employed.

The proposed assessment methodology refers to the following aspects:

- ✓ The extent to which the learning outcomes in terms of skills and competences have been achieved.
- ✓ The extent to which the acquired knowledge has been applied effectively in real life cases/scenarios
- ✓ Further aspects related to horizontal competences such as collaboration and communication and active participation in WBL

4.3.2.1 Recommended Techniques

The appropriate techniques used for work-based learning is dependent on the learning unit and style of the educator. A large number of techniques are available and well-documented but the specific recommended ones for RELIEF are as follows:

- ✓ **Project work:** In this case trainees are presented with problems, which must be analysed and solved; it requires learners to perform the synthesis of many concepts as well as their evaluation and prioritization when selecting which aspects of the project to report. In addition, monitoring the development of the projects allows the trainer to evaluate the process of scaffolding the concepts, to see where the learner may have had difficulties in learning. This is facilitated to:
 - o Evaluate in which parts of the process problems may arise
 - o Assess what prior knowledge the learner needs to possess
 - o Reveal much more than simple definitions of concepts involved in projects, which provide more information than objective tests and essays.

It is worth noting, that these projects are based on authentic assessment since they are based on a set of activities (practical, observation, critical thinking, etc.) connected to the **real-life practice of bioeconomy in agricultural settings**, the topic of particular LU and are well aligned with the RELIEF desired learning outcomes, in terms of skills and competences. Thus, Project-based learning allows the learners to develop autonomy, constructive investigations, goal setting, decision making, problem solving, collaboration, communication and reflection within real-world practices.

- ✓ **Case Presentations** This method allows the learner to demonstrate not just the technical competences acquired working to a project/case, but also to prove reflective and communication skills. It can have the form of either an oral presentation or a written report.
- ✓ **Discussion.** This activity can be a valuable source of formative assessment and monitoring, since it enables the program to be adjusted, if necessary. It supports the learner-centred approach where learners are encouraged to critically reflect upon training and express their opinions (Chaplowe & Cousins, 2015).
- ✓ **Self-assessment.** Learners will be asked to assess their own progress, as well as perceived strengths, weaknesses, and challenges. The questionnaires to be used should be in line with the task complexity and the specific objectives of the training.

4.3.3 Online Learning

Given that a part of the RELIEF training will be delivered in an online format and in a self-paced mode, it is essential to provide assessment methods and techniques that promote self-monitoring processes. Online learners need to manage their own learning through self-assessment, discovery learning, reflection, and communication. Learners should be also given an opportunity to enact

active role by planning, monitoring, and then reflecting and evaluating not only the learning tasks but the processes of learning as well (McLoughlin & Luca, 2002). Specific assessment techniques/ activities for online training, have been chosen for the RELIEF project. In the section that follows we provide some examples of possible assessment activities. All partners are advised to specify in the training program at least one suitable assessment activity for the end of each Learning Unit, serving as a summative assessment.

4.3.3.1 Recommended Techniques

The appropriate techniques used for online learning is dependent on the learning unit and style of the educator. A large number of assessment techniques are available and well-documented but the specific recommended ones for RELIEF are as follows:

- ✓ **Self- assessment questionnaire** which will be available at the end of each Learning Unit in a form of an online Quiz. It aims to help learners identify any errors and misunderstandings they may have in relation to the topic through a number of questions, providing feedback at the same time on correct and/or wrong answers. The types of questions that can be included in the questionnaire are:
 - True/ False questions
 - Multiple choice questions with a single answer
 - Multiple choice questions with multiple answers
 - Fill the Gap questions
 - Sorting choice questions
 - Matrix sorting

- ✓ **Gamified activities** that enhance learner’s learning in a more interactive and engaging way.
- ✓ **Reflective Questions** are used for repeating and understanding the given topic in relation to the learners’ experience and/ or knowledge. They might be short or more complex, they might be used also in a non-examination situation or as part of self-assessment tasks. They are generally open-ended questions that require students to construct a response. Within RELIEF training course several LUs provide questions for repeating and understanding and learners will use them as a part of self-assessment. However, some critical aspects of effective reflective questions concern the following:
 - questions should be written in such a way so to reveal a learner’s ability to describe, explain, reason, create, analyse, synthesise, and evaluate;
 - questions should give opportunities for learners to demonstrate higher level skills and knowledge;
 - questions should allow learners to elaborate on responses and herewith to prepare themselves for other ways of assessment;
 - questions should be structured in a range of different ways that require a range of responses from a few words to a paragraph.

The following Figure summarizes the assessment methods and techniques that will be used within the framework of RELIEF.

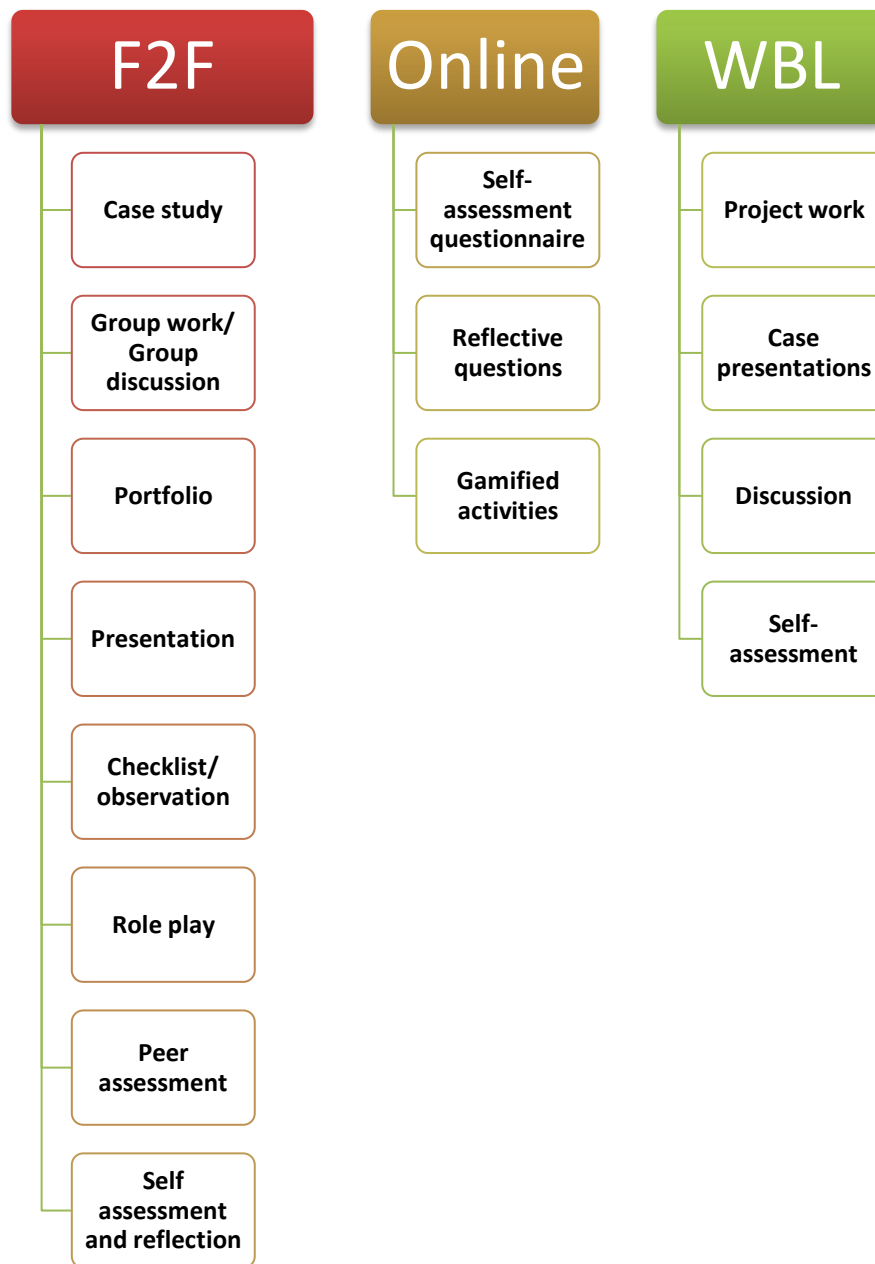


Figure 11. Summary of RELIEF Assessment methods and techniques

4.4 RELIEF Monitoring Tools

The tools that will be employed for monitoring the RELIEF training courses are part of the training materials and will be provided at a later stage and prior to the implementation of the piloting phase. The table below presents the tools foreseen for monitoring the RELIEF training courses.

Table 3: RELIEF monitoring Tools

Method of Delivery	What needs to be monitored	How to be monitored
Face to Face Training	Active Participation of Learners	Attendance Sheet
	Performance of Learners	Checklist with LO's achievement, practical activities/ assignments / case studies, Observation
	Learner's engagement	Trainer's guidance and support, report, self- assessment questionnaire
Online Learning	Active Participation of Learners	Logins and Logouts, reading additional resources provided (videos, articles, papers etc)
	Performance of Learners	Checklist with LO's achieved
	Learner's support and engagement	Completion of the LU, completion of gamified activities
Work Based Learning (WBL)	Active Participation of Learners	Attendance Sheets
	Performance of Learners	Completion of WBL's activities
	Learner's support and engagement	Trainer's guidance and support, report, self- assessment questionnaire

It is worth mentioning that the outcomes of formative evaluation will also be used for monitoring purposes.

References

- Allen, D. E., Donham, R. S., & Bernhardt, S. A. (2011). Problem-based learning. *New Directions for Teaching and Learning*, 2011(128), 21–29. <https://doi.org/10.1002/TL.465>
- ASQA (2015). Guide to developing Assessment Tools. Available at: [https://www.asqa.gov.au/sites/default/files/Guide to developing assessment tools.pdf](https://www.asqa.gov.au/sites/default/files/Guide%20to%20developing%20assessment%20tools.pdf)
- Bejar, I. I. (1984). Educational diagnostic assessment. *Journal of educational measurement*, 21(2), 175-189.
- Bélanger, P. (2011) *Theories in Adult Learning and Education*. Barbara Budrich Publishers, Leverkusen Opladen, Germany. 10.3224/86649362.
- Bell, B., & Cowie, B. (2001). The characteristics of formative assessment in science education. *Science education*, 85(5), 536-553
- Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability* (formerly: *Journal of Personnel Evaluation in Education*), 21(1), 5-31.
- Braun, V., & Clarke, V. (2021). Conceptual and Design Thinking for Thematic Analysis. *Qualitative Psychology*, 9(1), 3–26. <https://doi.org/10.1037/QUP0000196>
- Center for Teaching and Learning. (2015). *Experiential Learning | Center for Teaching & Learning*. <https://www.bu.edu/ctl/guides/experiential-learning/>
- Chaplowe, S. G., Cousins, J. B. (2015). *Monitoring and Evaluation Training: A Systematic Approach*. United States: SAGE Publications.
- Chuang, S. (2021). The Applications of Constructivist Learning Theory and Social Learning Theory on Adult Continuous Development. *Performance Improvement*, 60(3), 6–14. <https://doi.org/10.1002/PFI.21963>
- Clark, I. (2012). Formative Assessment: Assessment Is for Self-regulated Learning. *Educ Psychol Rev* 24, 205–249
- Collins, R. (2013). “Authentic assessment: assessment for learning”, *Curriculum Leadership Journal*, Vol. 11, No. 7. Education Services Australia. Available at: [http://www.curriculum.edu.au/leader/authentic assessment assessment for learning,36251.html?issueID=12745](http://www.curriculum.edu.au/leader/authentic%20assessment%20assessment%20for%20learning,36251.html?issueID=12745).

- Cranton, P. (1996). *Professional Development as Transformative Learning. New Perspectives for Teachers of Adults. The Jossey-Bass Higher and Adult Education Series.* <https://ezproxy.royalroads.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED400406&site=ehost-live>
- Davies, L. M., "Monitoring and evaluating adult education programs in the District of Columbia." (2003). Doctoral Dissertations 1896 - February 2014. 2364. Available at: <https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=3365&context=dissertations> 1
- De Graaff, E., & Kolmos, A. (n.d.). *Characteristics of Problem-Based Learning**.
- Dochy, F., Segers, M. S. R., & Sluijsmans, D. (1999). The use of self-, peer and co assessment in higher education: A literature review. *Studies in Higher Education*, 24(3), 331–350.
- Earle, A. G., & Leyva-de la Hiz, D. I. (2021). The wicked problem of teaching about wicked problems: Design thinking and emerging technologies in sustainability education. *Management Learning*, 52(5), 581–603. https://doi.org/10.1177/1350507620974857/ASSET/IMAGES/LARGE/10.1177_1350507620974857-FIG2.JPEG
- Elwood, J., & Klenowski, V. (2002). Creating communities of shared practice: The challenges of assessment use in learning and teaching. *Assessment & Evaluation in Higher Education*, 27(3), 243–256
- Evaluation Resource Hub (2021). Observations: A guide for use in evaluation. Available at: <https://education.nsw.gov.au/teaching-and-learning/professional-learning/pl-resources/evaluation-resource-hub/collecting-data/observation#:~:text=Observation%20provides%20the%20opportunity%20to,activity%20or%20situation%20being%20evaluated>.
- Freeman, R. (2005). *Creating learning materials for open and distance learning: a handbook for authors and instructional designers.* Commonwealth of Learning (COL).
- Freeth, R., & Caniglia, G. (2020). Learning to collaborate while collaborating: advancing interdisciplinary sustainability research. *Sustainability Science*, 15(1), 247–261. <https://doi.org/10.1007/S11625-019-00701-Z/TABLES/3>
- Girvan, C., Conneely, C., & Tangney, B. (2016). Extending experiential learning in teacher professional development. *Teaching and Teacher Education*, 58, 129–139. <https://doi.org/10.1016/J.TATE.2016.04.009>
- Growth Engineering (2021). EXPERIENTIAL LEARNING: A COMPREHENSIVE GUIDE TO ACTIVE EDUCATION. Available at: <https://www.growthengineering.co.uk/what-is-experiential-learning/>

- Hrastinski, S. (2019). What Do We Mean by Blended Learning? *TechTrends*, 63(5), 564–569. <https://doi.org/10.1007/S11528-019-00375-5/METRICS>
- Huba, M. E., & Freed, J. E. (2000). *Learner-centered assessment on college campuses: Shifting the focus from teaching to learning*. Boston: Allyn and Bacon.
- Karl, S. (2020). The Design Thinking Process – How does it work? Available at: <https://www.mage.com/insight/the-design-thinking-process-how-does-it-work/>
- Kasworm, C. E., & Marienau, C. A. (1997). Principles for Assessment of Adult Learning. *New Directions for Adult and Continuing Education*, 1997(75), 5–16. doi:10.1002/ace.7501
- Krahenbuhl, K. S. (2016). Student-centered Education and Constructivism: Challenges, Concerns, and Clarity for Teachers. <Http://Dx.Doi.Org/10.1080/00098655.2016.1191311>, 89(3), 97–105. <https://doi.org/10.1080/00098655.2016.1191311>
- Kurt, S. (2021). *Constructivist Learning Theory - Educational Technology*. <https://educationaltechnology.net/constructivist-learning-theory/>
- McLoughlin, C., & Luca, J. (2002). A learner-centered approach to developing team skills through web-based learning and assessment. *British Journal of Educational Technology*, 33(5), 571–582
- Morgan, C., & O'Reilly, M. (2001). Innovations in online assessment. In f. Lockwood & A. Gooley (Eds.), *Innovations in Open & Distance Learning: Successful Development of Online and Web-Based Learning* (pp. 179-188). London, England: Kogan Page.
- Minhaz, M. (nd). *Monitoring and Evaluation: Process, Design, Methods*. Available at: <https://www.iedunote.com/monitoring-and-evaluation#monitoring-definition>
- National Research Council (2001) *Knowing what Students Know: the science and design of educational assessment*. Washington, D.C.: National Academy Press https://www.academia.edu/68731640/Knowing_what_students_know_The_science_and_design_of_educational_assessment
- Pande, M., & Bharathi, S. V. (2020). Theoretical foundations of design thinking – A constructivism learning approach to design thinking. *Thinking Skills and Creativity*, 36, 100637. <https://doi.org/10.1016/J.TSC.2020.100637>
- Paris, B., Michas, D., Balafoutis, A. T., Nibbi, L., Skvaril, J., Li, H., Pimentel, D., Silva, C. da, Athanasopoulou, E., Petropoulos, D., & Apostolopoulos, N. (2023). A Review of the Current Practices of Bioeconomy Education and Training in the EU. *Sustainability 2023, Vol. 15, Page 954, 15(2)*, 954. <https://doi.org/10.3390/SU15020954>
- Popham, W. J. (1999). *Classroom assessment—What teachers need to know. 2nd Ed*. Boston: Allyn and Bacon

- Race, P. (2014) *The Lecturer's Toolkit. A practical Guide to Assessment, learning and teaching*. 3d edition. Routledge: New York
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/10.1016/J.COMPEDU.2019.103701>
- Taylor, R. M. (2009). Defining, constructing and assessing learning outcomes. *Revue scientifique et technique*,
- Tillema, H., Leenknecht, M., & Segers, M. (2011). Assessing assessment quality: Criteria for quality assurance in design of (peer) assessment for learning – A review of research studies. *Studies in Educational Evaluation*, 37(1), 25–34. doi:10.1016/j.stueduc.2011.03.004
- UNSDG Project. (nd). Problem-based learning. Available at: <https://www.unsdgproject.com/problem-based-learning.html>
- UNSW Sydney (nd). Assessment through case studies and scenarios. Available at: <https://www.teaching.unsw.edu.au/assessment-case-studies-and-scenarios>
- Vonderwell, S., Liang, X., & Alderman, K. (2007). Asynchronous discussions and assessment in online learning. *Journal of Research on Technology in Education*, 39(3), 309-328. 28(2), 779. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=f464e0012589dc7bce1202ccf31458deb09ae9d7>

Annex 1: Critical Thinking Questions

ANNEX 1: CRITICAL THINKING QUESTIONS

Step 3: WHO?

- Benefits from this?
- Is this harmful to?
- Makes decisions about this?
- Is more directly affected?
- Have you heard discuss this?
- Would be the best person to consult?
- Will be the key people in this?
- Deserves recognition for this?

Step 4: WHAT?

- Are the strengths/weaknesses?
- Is another perspective?
- Is another alternative?
- Would be a counter-argument?
- Is the best/worst case scenario?
- Is the most/least important?
- Can we do to make a positive change?
- Is getting in the way of our actions?

Step 5: WHERE?

- Would we see this in the real world?
- Are there similar concepts/situation?
- Is there the most need for this?
- In the world would this be a problem?
- Can we get more information?
- Do we go for help with this?
- Will this idea take us?
- Are the areas for improvement?

Step 6: WHEN?

- Is this acceptable/unacceptable?
- Would this benefit our society?
- Would this cause a problem?
- Is the best time to take action?
- Will we know we've succeeded?
- Has this played a part in our history?
- Can we expect this to change?
- Should we ask for help with this?

Step 7: WHY?

- Is this a problem/challenge?
- Is it relevant to me/others?
- Is this the best/worst scenario?
- Are people influenced by this?
- Should people know about this?
- Has it been this way for so long?
- Have we allowed this to happen?
- Is there a need for this today?

Step 8: HOW?

- Is this similar to _____?
- Does this disrupt things?
- Do we know the truth about this?
- Will we approach this safely?
- Does this benefit us/others?
- Does this harm us/others?
- Do we see this in the future?
- Can we change this for our good?

Annex 2: Mindset Log

Situation	My thoughts after setback or failure	Fixed or growth mindset?	Thoughts of a growth mindset	Actions of a growth mindset
<i>E.g., I applied for a job and didn't get it.</i>	<i>I'm not good enough. I wasn't impressive enough.</i>	<i>Fixed</i>	<i>I did my best, and I can learn from my mistakes.</i>	<i>Ask for feedback from the interviewer and use this to prepare for my next job interview</i>



Relief

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