D3.6: Report on educational strategy, year 4

WP3 – Future curriculum, education and training system

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1 Extended summary

1.1 Introduction

The complex and often wicked sustainability challenges in farming, food and forestry systems call for an education fostering a systems approach and competences needed to take informed action. The Nextfood project (2018–2022) responds to this call by conducting action research in twelve educational cases in transition to experiential education where interactions between students, teachers and stakeholders “in the field” form the starting point for learning. In this report, the results from the last cycle of action research are reported. The cases are all at various stages of implementing the “Nextfood approach” to action learning in formal courses and other types of educational activities within agrifood and forestry systems. The Nextfood project suggests that two overall shifts are needed to meet the needs posed by the sustainability challenges:

> From theory to phenomenon (experience) as the starting point for the learning process.
>
> From transmission of knowledge to the development of key competences as the educational goal

This report is structured according to the research questions of Nextfood’s work packages two and three. In summary, those regard experiences and competence development of students involved in action learning and the overall process of case development, which includes supporting and hindering forces for implementing the approach.

1.2 Methodology

The data material for this report consists of all the Nextfood cases’ annual case development reports for the fourth year of Nextfood. In these reports, the cases reported their findings from the last cycle of action research on their educational activity. Collecting these data entailed guiding the cases in how to follow the research protocol as presented in D2.1 “Research protocol (M14)” and providing them with instructions for data analysis and further training and guidance on how to conduct action research. The case-specific methodology is reported in the deliverable D2.8 “Annual case development report (year 4, M48)”.

The case development reports were subject to qualitative content analysis with an inductive approach (Bernard 2006) in the software NVivo (QSR International). The case development reports were structured according to the WP2 and 3 research questions, which enabled comparison across cases.

1.3 Sum-up of results

1.3.1 Students´ perceptions, learning and competence development in twelve cases in transition to the Nextfood action learning approach

1.3.1.1 How do students involved in action learning perceive what are important learning goals, which competences are needed for sustainable development, own competences and competence development, and whether transformative learning takes place?

The learning goals of the students in the different cases seemed to vary to a large degree based on the topic of the courses. A difference was registered in how much learners emphasised action learning competences (i.e., the Nextfood core competences of observation, reflection, participation, dialogue, and visionary thinking) compared to topical knowledge. Furthermore, the learners perceived that activities in the field helped them to identify their knowledge gaps and, thus, to inform their direction of knowledge acquisition.

Learners' focus on sustainability competences was influenced by multiple factors, such as the duration of the course and to what extent the course emphasised competences for sustainable development. Collaborative skills, know-how and knowledge about agrifood and forestry systems, critical thinking and holistic thinking were competences mentioned by many as important for sustainability.

The learners' self-assessment at the beginning and end of the courses suggested that they considered to improve significantly on the five core competences of Nextfood. Visioning tended to receive a lower score than the others, but the increase during the courses was similar for all competences.

When it comes to learner transformation, there are some differences in how the cases have reported but, there are some recurring findings. For example, many cases mentioned how their learners through the participatory and reflective activities in the course saw their past experiences with traditional, conventional education in a new light, and even with "distrust". When engaging in this novel approach, they changed their perception of learning. This was supported by reports that learners developed an ability of self-questioning and became more autonomous and less reliant on teacher instructions. Lastly, it seemed that learners changed their attitude towards groupwork, and became more open to engage and interact with peers.

1.3.1.2 To what extent do educational activities enhance the students' competences in observation, reflection, visionary thinking, participation (engagement), dialogue and dealing with "the challenge of the whole" (systems thinking)?

For the development of all core competences, learners seemed to especially benefit from the participatory character of the courses and the engagement in fieldwork. Furthermore, targeted exercises for each competence in combination with reflection enabled cultivation of the competences. Visionary thinking is an example of one competence that was particularly developed this way, especially when the learners also were given the possibility of facilitating visionary thinking sessions, e.g., for stakeholders in the field. To enhance proficiency in dialogue, structured reflection activities and support from facilitators was important. Many learners struggled to understand reflection, and it was sometimes challenging to get them to reflect.

However, setting off time to reflect and providing structure for doing so, either through plenary sessions, written reflection logs and documents or allocating time for individual reflection, enhanced the learners' competence in this regard. In interaction with stakeholders in the field and with peers in group work, the learners got to practice dialogue, and in doing so they were able to distinguish dialogue from other forms of communication, such as debate or discussion.

Nevertheless, a common tendency among cases was that many learners struggled to distinguish between the everyday activity related to the competences and the cognitive and intentional act of practicing them. For example, many students spoke of communication, without specifying intentionally using the guidelines for dialogue, and others "observed" without mindfully suspending judgement. The same goes for visionary thinking, where learners reported "imagining the future", without explicitly practicing visionary thinking as a competence with all that it entails. These findings represent one important challenge of implementing the approach: The introduction of the core competences as competences and the facilitation of competence cultivation among learners.

1.3.2 The development of the Nextfood approach in twelve cases

1.3.2.1 What are the supporting and hindering forces for change towards the Nextfood approach in education?

The shift from lecture hall to a diversity of learning arenas was reportedly supported by:

- External stakeholders' involvement,
- the discovery and more intense use of online learning arenas due to the Covid-19 pandemic,
- the discovery of new learning arenas close to or on campus due to the pandemic,
- students' appreciation of the diversity,
- involvement of the entire teaching team in the diversification process,
- availability of diverse field sites, and
- institutional support.

Hindering forces were:

- external stakeholders' lack of involvement,
- restrictions because of the pandemic making field visits impossible or difficult to organise, and
- institutions' lack of support or even resistance to a shift towards more diversity of learning arenas.

The shift from lecturing to co-and peer learning was supported by:

- a good size and combination of skills in the group of teachers and facilitators,
- diversity in the student group, and
- a non-hierarchical structure combined with openness and trust-building.

Hindering forces were:

- students' challenges to adapt to the approach and
- conflicts amongst students.

The shift from syllabus to supporting literature or a diversity of learning sources was supported by:

- providing students with a bibliography and links to other sources at the start of the course or educational activity,
- technical and online solutions to find and share learning sources,
- student's learning along the way in finding and selecting learning sources, and
- everyone's motivation in diversifying the learning sources and supporting literature.

Hindering forces were:

- teachers finding a syllabus convenient,
- lack of clear instructions from teachers to students on how to find and select literature and learning sources,
- challenges for students to find and use learning sources such as a weak internet connection,
- students' variable levels of understanding of English and academic language, and
- institutional constraints such as strict requirements for having a specific syllabus in all courses.

The shift from textbook to a diversity of teaching aids was supported by:

- online learning environments and
- having already developed a wide range of diverse teaching aids developed over the past Nextfood years.

Hindering forces were:

- a lack of sufficient time to develop or select new teaching aids and
- students' feeling insecure about using a diversity of teaching aids.

The shift from written exam to a diversity of assessment methods was supported by:

- including a final group presentation at the end of the casework as assessment methods because it creates inspiration and motivation for all involved, and
- time to establish new assessment methods over the years (of Nextfood and beyond).

Hindering forces were:

- difficulties of teachers and students to let go of the traditional methods,
- unclarities or doubts for both teachers and students about what evaluation consists of in the new methods, and
- students not easily filling in forms from new assessment methods if they participate voluntarily in the course or educational activity.

The shift from lecturer to learning facilitator was supported by:

- teachers that were already facilitators from the start or have become facilitators throughout the Nextfood project,
- being in a group of facilitators with complementary skills and competences and the possibility to collaborate closely,
- having enough time to be involved in the course or educational activity,
- the non-hierarchical dynamics inherent to the approach, and
- good communication between participants in groups.

Hindering forces were that:

- facilitation of group work is particularly challenging,
- it takes a long time to change the mindset of students and teachers, and
- students need much time to become confident enough to interact with facilitators.

1.3.2.2 What does a shift to the Nextfood approach require from teachers, students and institutions?

From teachers, the shift requires:

- improved communication,
- attention to group dynamics particularly helping students to build trust in groups and managing conflicts and diversity, and
- self-training in the core competences.

From students, the shift requires:

- embracing change and stepping out of the comfort zone,
- self-organisation,
- self-awareness, and
- the courage to communicate and interact with all others involved in the course or educational activity.

From institutions, the shift requires:

- providing enough resources and teachers' training,
- a shared vision for sustainable education, and
- allowing a certain degree of self-managed teacher teams.

1.3.2.3 What do the teachers perceive as the greatest challenge to achieving a shift to the Nextfood approach?

Lack of time was the greatest overall challenge perceived by teachers, both during the course or educational activity and for development of a case. Furthermore, teachers perceived limited resources and lack of support as the main challenge related to institutions; lack of training as the main challenge related to teachers and facilitators; clear communication (particularly regarding expectations) and diversity in the student group as the main challenges related to students; and involvement, uncertainties as well as motivation and lack of communication skills as the main challenges related to stakeholders.

1.3.2.4 *What do the cases perceive to be the main outcomes of the Nextfood project with regards to making the overarching shifts?*

Towards the end of the project, all cases were asked to reflect on the whole project period and assessing their accomplishments regarding the two overarching shifts. This reflection was used to define main challenges and ideas to overcome them.

The shift from theory to phenomenon as starting point for the learning process was done by involving students in real-life cases. Training the competences was highlighted as important for making this shift. Moreover, participation in the Nextfood project had helped cases to make progress. Applying a diversity of innovative learning activities and involving stakeholders in courses were other helpful measures. Based on their experience, cases provided each their list of prerequisites for making the shift, including prerequisites for institutions, teachers, students, and other stakeholders.

The shift from transmission of knowledge to development of key competences for sustainable development was pursued through inclusion of real-life situations and action-based activities in the courses. The different cases focused on the competences to a varying degree in their courses, and their experiences with making this shift differed accordingly. However, while making the shift, teachers in the cases improved their facilitation competence, which further allowed them to support students in developing their competences. For this shift, the cases made lists of advice based on their experience. A major advice was to focus on the development of core competences. Another one was to train the teachers as facilitators.

The cases' challenges were manifold, but when analysing the identified main challenges, most of them pertained to how to spread action learning in one way or another, as in communicating and motivating for the approach. Ideas to overcome the challenges pertained mainly to communication (including dissemination), involvement of relevant actors, and building of a competent network of action learning practitioners. Some ideas were quite general, while others were more specific in terms of actors to involve and actions to make. All in all, the case reports of these final reflections towards the end of the Nextfood project shed light on their experiences and can provide valuable recommendations for others who are keen on implementing the Nextfood approach.

1.3.3 Concluding remarks on the case development since the previous reporting

1.3.3.1 *What do the cases perceive as the most useful and inspiring experiences, the main challenges, and the lessons learnt from dealing with those during the last cycle?*

Enthusiasm from all involved in the course or educational activity is without doubt the most inspiring experience. Restrictions due to the Covid-19 pandemic and limited time and resources were main challenges. Lessons learnt were that good planning, the core competences, training of teachers in facilitation, and continuous and clear communication amongst all involved are key. Additionally, to implement a multi-stakeholder approach, a diverse range of stakeholders should be invited to engage with students, and good relationships with stakeholders are a must.

1.3.3.2 How do the cases plan to move forward after Nextfood?

Some cases would like to disseminate results and share experiences to convince others of the usefulness of the approach. Others would like to improve further on implementing a multi-stakeholder approach. Most cases plan to continue with the approach. Some have searched networks and funding to do so, whereas others plan to continue with parts of the approach that require less resources and time.

1.3.3.3 Suggestions for further research

- How can the action learning approach be adapted to different types of learners?
- What are prerequisites for becoming a facilitator of learning – and how can these be met?
- How can stakeholders contribute to and benefit from their involvement in action-oriented education?
- How can the action learning approach be implemented at a whole-institution level?

2 Introduction

Human activities, e.g., in agrifood and forestry systems, pose a plethora of challenges ranging from relatively simple technical problems to entangled ones and problems that may even be difficult to define, particularly when involving stakeholders with different views and interests. This is frequently called a messy situation with wicked problems (Batie, 2008; Hjortso et al., 2005). The sustainable development goals of the UN pertain to such situations, which require a system perspective (Weitz et al., 2018). This may be termed "the challenge of the whole" (Schmidt-Bleek et al., 2014). "Embarking on the path of sustainability will require a profound transformation of how we think and act" (UNESCO, 2017). It requires not only subject-specific knowledge and technical skills, but also cross-cutting competences related to human interaction and development (UNESCO, 2017), so-called 'sustainability' competences (Frisk & Larson, 2011). As competences cannot be learnt but must be trained, the dominant, often knowledge-centred education is insufficient for developing the capacity for facilitating change, e.g., at various levels of agrifood and forestry systems (D3.1 "Educational approaches").

There is ample evidence of the need for a shift towards action-oriented and student-centred learning to train the competences required for dealing with sustainability challenges (D3.1 "Educational approaches"). There is also substantial knowledge about what constitutes such learning within an overall education for sustainability approach (UNESCO, 2017). What we need more knowledge about is (A) the outcomes in terms of the learner's knowledge acquisition and competence development during and after the educational transition process and (B) what the implementation phase during such a shift in education entails and requires. The latter also goes for the policies needed to support the transition process and further development of the education.

The major objective of Nextfood WP2 and WP3 is to contribute to bridging some of these knowledge gaps by conducting action research (Levin and Ravn, 2007) in twelve educational cases at various stages of transition from mainstream, theory-based teaching to the Nextfood approach, which is a phenomenon-based, action-oriented approach to learning aimed at a transformative cultivation of the competences required for sustainable development (D3.1 "Educational approaches"). In Nextfood, action-learning has been used in a broad sense (McGill and Beaty, 2001). Action learning build on the works of Revans (1998), and also on experiential (Dewey, 1916 transformative (Mezirow, 2000) learning.

The Nextfood approach has a student-centred emphasis on cross-cutting core competences or so-called soft skills (*wiz*., observation, participation, dialogue, visionary thinking, reflection, and systems thinking), and it makes use of diverse learning arenas, co- and peer learning activities, learning sources, teaching aids and assessment methods. The approach implies a shift from teaching to facilitating learning and competence development. This sums up to two overarching shifts for education to develop towards the Nextfood approach (D3.1 "Educational Approaches"):

- From theory to phenomenon (experience) as the starting point for the learning process.

- From transmission of knowledge to the development of key competences as the educational goal

In WP2 and WP3, the two main knowledge gaps mentioned above, have been addressed with the following research questions:

A. Students´ learning and competence development in twelve cases in transition to the Nextfood action learning approach

- How do students involved in action learning perceive:
  - Which learning goals are important?
  - Which competences are needed for sustainable development?
  - Own competences and competence development?
  - To which extent transformation into active, reflective, life-long learning takes place?
- To what extent do educational activities enhance the students' competences in observation, reflection, visionary thinking, participation (engagement), dialogue and dealing with "the challenge of the whole" (systems thinking)?

B. The development of the Nextfood approach in twelve cases

- What are supporting and hindering forces for change towards the Nextfood approach in education?
- How can we build on the supporting and address the hindering forces (reformulated as challenges) for change?
- What does a shift to the Nexfood approach require from teachers, students, involved stakeholders and institutions?
- What do the teachers perceive as the greatest challenge to achieving a shift to the Nexfood approach?

During the last period of reporting, the case development has also been addressed by the following additional questions:

- What has been accomplished to shift from theory to phenomenon (experience) in agrifood- and forestry systems as the starting point for the learning process?
- What has been accomplished to shift from *transmission of knowledge* to the *development of key competences* needed to support sustainable development in agrifood and forestry systems?
- What are the prerequisites for making a successful shift?
- What are concrete advice on the shift from simple knowledge transmission to the development of key competences?
- What are the main challenges and how to deal with them?

The present report covers data gathered in the twelve educational cases during the period since the previous report (D3.5 "Report on educational strategy, year 3") was delivered and constitutes a synthesis of the individual case development reports as compiled in the report D2.8 "Annual case development report (year 4, M48)"

Throughout the report, the authors will refer to both "learners" and "students", "teachers" and "facilitators". In the educational cases, all students are learners, but not all learners are students in terms of being enrolled in a regular course. All teachers are or train to become facilitators, but not all facilitators are teachers.

Regardless, the terms will be used interchangeably. The cases, the course titles and duration and the level of the learners are presented in Table 1.

Table 1: Overview of the Nextfood cases and their courses.

The Nextfood Cases

Case	Abbreviation	Title, duration	Learners, level
Case 1: Norwegian University of Life Sciences, Norway	NMBU	Agroecology: Action learning in farming and food systems, 5 months	17, Master
Case 2: University of Oradea, Romania	UNIOR	Students and farmers taking food innovations from idea to market, 10 months	12, Mixed (high school students, undergraduates, master)
Case 4: ISEKI Food Association, Austria	ISEKI	FoodFactory-4-Us, 4 months	16, Master
Case 5: American Farm School and International Hellenic University, Greece	AFSIHU	Food Science and Technology + Agricultural Technology, 6 months	7, Undergraduate
Case 6: SKOGFORSK, Sweden	SKOG-FORSK	Towards a profitable and sustainable forestry chain – increased quality and number of micro-habitats for enhanced biodiversity, 5 months	10, Vocational
Case 7: University of South Bohemia, Czech Republic	USB	Development of sustainable farming systems, 3+3 months	9, Master
Case 8: University of Gastronomic Science, Italy	UNISG	Master in Agroecology and Food Sovereignty, 12 months	16, Master
		One-week course of Agroecology and Sustainable Agriculture, 1 week	23, Master
Case 9: University of Calcutta, India	UoC	One month online certificate course for Food Entrepreneurs, 1 month	14, For bachelor's degree holders
Case 10: SEKEM Development Foundation, Egypt	SEKEM	Biodynamic Agriculture Course, 2+2 weeks	36, Bachelor
		Entrepreneurship Program, 7 months part-time	20, Post-graduate
Case 11: CIHEAM Bari, Italy	CIHEAM	Mediterranean Organic Agriculture, 6 months	9, Master
Case 12: University of Kerala, India	UoK	Certificate Course on Agroecology: Action Research and Education, 1 month	8, Post-graduate
Case 13: University of Chile, Chile	UCH	Linking agroecology with society, 4 months	6, Undergraduate

3 Methodology

The cross-case analysis consists of three major parts: students' perceptions, learning and competence development, the overall process of case development, and concluding remarks from case leaders on the development of their case. The data for this cross-case analysis are the case development reports of 2022, as presented in D2.8 "Annual case development report (year 4, M48)".

Collecting the data consisted of guiding the cases in how to follow the research protocol as presented in D2.1 "Research protocol (M14)" and providing them with instructions for data analysis and further training and guidance on how to conduct action research. Additionally, to streamline data analysis and reporting, the cases were asked to use a template for their case development reports and feedback was given on draft reports. This feedback aimed at ensuring that all cases had analysed and reported on their action research in sufficient depth and that they had followed the template. D2.8 "Annual case development report (year 4, M48)" presents the results of this process of data collection and, thus, the data set for the present cross-case analysis. For details on how the respective cases collected and analysed their data, please visit the D2.8 deliverable.

The cases have to the best of their ability followed the guidance and instructions from the WP leaders. Nevertheless, variance in the extent to which cases have followed the instructions for data collection, analysis and reporting pose some limitation to the present cross-case analysis. Additionally, the cross-case analysis rests on the WP3 researchers' understanding of the case reports.

More specifically, the reliability of the results on **student perceptions, learning and competence development** as reported by the cases depends on the case researchers' interpretation and understanding of the instructions for data collection and analysis. Different traditions and practices related to how education is organised at the teaching institutions may have caused some variation. Even though efforts have been made to streamline this process to facilitate cross-case analysis, the diversity of cases and situational adaptations pose some limitations.

The reliability of the results on **the overall process of case development** also depends on the extent to which cases have followed the instructions. Not all cases have conducted a Force Field Analysis (FFA) at the end of their last cycle to reflect on the overall process of case development, and those that did so, varied in who participated (i.e., teachers, facilitators, students, alumni, mentors, institutional representatives, or external stakeholders) and how closely they followed the instructions for FFA. Therefore, in the cross-case analysis equal weight has not been given to all cases during the analysis of the overall process of case development. More specifically, more weight has been placed on the results presented by cases that had conducted a FFA than to those cases that had not.

The reliability of the results on **concluding remarks on case development** is for the first part (i.e., concluding remarks on the case development since the previous reporting) dependent on the extent to which the cases have conducted and reported a Force Field Analysis and whether they have done a reflection session covering the aspects of case development mentioned in that section. For the second part (i.e., reflections towards the end of the Nextfood project), the reliability of the results

depends on the depth of the cases' analysis and reporting, given that this part was based on workshops facilitated by the WP-leaders. Thus, all workshops were facilitated in a similar manner, and detailed notes were taken by the WP-leaders for all workshops and then shared with the cases for further analysis and reporting based on the provided template.

The cross-case analysis consisted of content analysis of the case development reports based on inductive coding (Bernard, 2006). Firstly, all individual case development reports were uploaded in the qualitative data analysis software NVivo (QSR International), and a cross-case report was generated per research question. This was a *de facto* restructuring of the dataset based on the titles and subtitles in the case development reports, which were aligned with the research questions phrased roughly as in the Introduction section above.

Secondly, all those cross-case reports were inductively coded for similarities and discrepancies across cases with reference to the respective research questions. Thirdly, similarities across two or more cases and discrepancies that were informative to respond to the respective research questions, were reported on. Three researchers were co-responsible for the cross-case analysis for the entire D3.6-deliverable, one for the "student learning"-related sections (subtitles 1 and 2 above), one for the "case development"-related sections (subtitles 3, 4 and 5 above) and one for the "overarching shifts"-related sections (subtitles 6 up to 10 above). To ensure reliability of the results, the three researchers had regular discussions of the results throughout the analysis process.

4 Students' learning and competence development: findings and discussion

4.1 How do students involved in action learning perceive:

4.1.1 Which learning goals are important?

The learning goals of the students in the different cases varied to a large degree, seemingly depending on the topic of the course at hand and to which extent field activities were in the centre. Not all cases reported specifically about the students' own learning goals. Consequently, it is challenging to pinpoint specific commonalities across cases. However, there was a difference in how much students emphasised action learning competences in relation to topical knowledge. Field activities helped students to identify their gaps in knowledge.

All cases' educational activities have pre-set learning goals related to the topic of the course, e.g., "knowledge of farming and food systems" (NMBU), "identify and deal with real farm problems" (AFS/IHU Action learning set), and "increased knowledge about social capital as a component of organic agriculture" (CIHEAM). Not surprisingly, in most cases the students mentioned agrifood, forestry or sustainability-related learning goals. In some cases more than others, the students seemed to have adopted the objectives of action learning, e.g., learning how to learn, rather than to obtain subject-specific knowledge. For example, at NMBU, students were more focused on "how to understand"—as in how to understand and how to act in farming and food systems rather than plainly "what is". Arguably, the course's aim of competence development rather than knowledge transfer is internalised by the students in their formulation of own learning goals. This is similar in the UoK case, where the students explicitly wanted to learn action research approaches to understand sustainability issues, and the ISEKI case, where the students' responses to the initial questions indicated that they would like to train skills for "navigating in a changing world" (ISEKI_CDR_2022).

In contrast, the students in both the SEKEM and the UoC case were seemingly solely concerned with the topical questions related to the course, i.e., related to organic farming and agricultural practices, business and account management, or consumer behaviour and marked economy. Notwithstanding, the UoC students did report having learned the Nextfood core competences at the end of the course, and they found these to be useful. Based on the cross-case comparison, one common denominator for most of the cases was how the activities "in the real world" contributed to students' learning and development, as exemplified in the below report quotes:

> *"There are many examples in the reflection documents that confirm that the learners appreciated visiting different properties and hearing that particular forest owner's thoughts about her or his forest"* (Skogforsk_CDR_2022)

> *"Students opine that they learned how to involve in field and this helped them to understand how hard it is to work in real life situations, compared to learning theories"* (UoK_CDR_2022)

> *"Students mentioned that they learnt how to plan as well as get more detailed information about planning from experts and farmers which they mentioned is a great skill that will help them going forward in their students as well as in practice."*(USB_CDR_2022)

"At the end of the course technical competence have increased their weight, and the textual analysis of the single answers (that have been coded for easy visual presentation), show progress towards the course learning goals mainly in terms of acquired knowledge of organic agriculture and social capital understanding, acquisition of skills for interacting with stakeholders (dialogue, participation, context analysis ability) and problem solving." (CIHEAM_CDR_2022)

In CIHEAMs case, one could argue, or at least wonder, that the fact that students put more weight on the technical competence at the end of the course was due to them being able to identify knowledge gaps by interacting and participating in the field throughout the course, which rings true in other cases. For example, at NMBU, students' spoke of learning how to learn about farming and food systems, and how the fieldwork helped them to identify what kind of knowledge is needed. This resonates with what is reported from the UCHcourse in agroecology: Even though the students identified a need for more technical competence in the field of farming and food, they were still fuelled by a commitment to the stakeholder, which in turn made them realise the importance of a shift in education from knowledge transmission to competence development, co-creation and sharing.

"During the last session, students also mentioned they lacked more technical and specific concepts about agroecology in order to have a better basis on their technical recommendations to the stakeholders. On the other hand, the students showed fully committed to the assignment, not only because this was an important part of the course final grade, but because they had a commitment with the involved stakeholders. In that sense, this is related to the third learning outcome of the course: Develop personal commitment and dedication when interacting with social actors and the teaching team, strengthening relationship skills in different cultural and/or community contexts. Thus, students know the value of interacting with social actors, in order to have a richer experience and a richer work in the field "Understand that we need to start using knowledge sharing and co-creation rather than knowledge transfer… Remember that we have 2 ears and 1 mouth, apply this in everyday life and particularly in qualitative research, but do not forget that one is part of this research by being inserted in the place that we are studying" (Student_2_reflection document 2021)" (UCH_CDR_2022)

It also seemed that even if the students hadn't listed developing the core competences as learning goals, they experienced how the action learning approach applied in the courses contributed to their development of competences. The UNIOR report supported this notion:

"According to the answers to the final questions, the practical activities included in the course covered all the stages of designing a food product and they admitted that they could work efficiently on the task they had to do. Even if there were students who at the beginning of the course wanted to learn something else, they admitted that this happened because at that moment they had no idea what kind of product they would like to do.

The reflection documents of the students also reveal that they succeeded in practicing extensively competences like: reflection, participation, visioning, observing, group work and critical thinking and they were content with the final result of the project considering it a very good experience. The several mentions of different activities meant to develop the five key competences are an example that can support this statement." (UNIOR_CDR_2022)

Students' reported learning outcomes and competence development will be covered in more detail in section 3.2.2.2.

4.1.2 Which competences are needed for sustainable development?

Students' understanding of sustainability competences was influenced by several factors such the length of the course and to what extent such competences were in focus. Collaborative skills, knowledge on agrifood systems, critical thinking and a holistic view were competences mentioned by many as important for sustainable development.

How the cases have reported on their students' view on competences needed for sustainable development varied between cases and depended on what data they had collected to answer the question. Not all cases collected data by the prescribed 4+5 initial and final questions from the D2.1 Action Research Protocol, which specifically ask students about what competences we need for sustainable development. I.e., for cases that did not collect this data, providing results on this was perhaps more challenging than for others. For example, in the AFS/IHU case, the learners were not asked these initial questions, and in the Skogforsk case the learners were asked about competences necessary for learning, not for sustainable development. The UNIOR case reported on the competences the students viewed as important for their future career, which arguably could be linked to sustainable development. However, the different ways of formulating the questions inevitably affected the reported findings and overall cross-case comparison.

Moreover, what the students emphasised as integral knowledge and skills for sustainable development depended on what the course focused on and how. For example, whether the students were introduced to the core competences before answering the four initial questions, and how much the core competences were "centre-stage" during the course most likely influenced the students' responses. Additionally, the students' views on competences needed for sustainable development varied depending on whether they were familiar with the concepts from before. In the case of AFS/IHU, it seemed as if the students were so unfamiliar with the core competences and action-based learning, that it was difficult for them to discuss sustainability concepts at all. However, they noted that the course module they were a part of in the "laid the ground" for developing sustainability competences.

There are a few commonalities across cases when it comes to learners' views on sustainability competences and their experiences with this throughout the educational activities:

- **Communication and collaboration** (teamwork, dialogue, empathy – "soft skills") was mentioned as important by students at NMBU, CIHEAM, ISEKI, UCH, UNISG (MAFS and MOG), UoK and USB – both at the start and at the end of the courses. Communication was also mentioned by the Skogforsk learners as a competence important for learning. Based on the cases' reports it does seem as if these interpersonal skills increased in importance at the end of the course. The excerpts from UCH's and CIHEAM's case development reports illustrate this quite well:

"The answers were focused mainly on the ability of building a relationship with farmers and other stakeholders in the field, in order to exchange knowledge and learnings." (UCH_CDR_2022)

"The word frequency in the answers at the end of the cycle show a persistence of the term sustainability, organic agriculture, development, agri-food, which represent a general

framework of reference for the students. It is interesting to note that at the end of the cycle a more prominent use of the terms participation, problem solving, dialogue, farmers, knowledge, communication is recorded, allowing to interpret the data as an indication of the stepping up in the scale of students' learning priorities of soft skills and the role of agricultural stakeholders."(CIHEAM_CDR_2022)

The students in the cases viewed these so called "soft skills" or skills for "building relationships" as crucial for sustainable development, and at the same time they found that the courses at hand helped them develop these skills through participatory activities.

- **Knowledge of agrifood and forestry systems, including sustainability practices and "main concepts".** Almost all cases mentioned how their students viewed knowledge of farming, food or forestry systems as important for sustainable development, which is not surprising. Some cases had students also more focused on "how to learn" and obtain this knowledge, such as NMBU. In relation to sustainable practices, both NMBU, UoK, CIHEAM and UNIOR specifically mentioned how their students reported "learning from practice", "participation" or "action learning" as important sustainability competences or skills. ISEKI reported how their students had developed an increased awareness of sustainability in food systems through being exposed to best-practice examples. As their students spoke more of interpretation and negotiation of sustainability towards the end, one could argue that this was due to the students' reported change in views on sustainability competences from start to end.

- **Problem-solving and critical thinking skills,** were also viewed by the students as important for sustainable development. To build on the previous example from the ISEKI report, one could argue that the students' enhanced awareness of sustainability issues through the course contributed to their development and emphasis on problem-solving and critical thinking skills as sustainability competences. As shown in the below quote:

"Students are exposed to various best practice examples related to the competition topic and engage in discussion with peers. Exposure to the sustainability topic may have contributed to raise students' awareness of it, while also having improved their skills in problem-solving and thinking critically." (ISEKI_CDR_2022)

Other cases also mentioned problem-solving and critical thinking as sustainability skills, such as CIHEAM, USB, NMBU, and UNISG – MAFS. Learners at Skogforsk, ISEKI, NMBU and UNISG also mentioned increased awareness as important, which can be linked to this point as well.

- **A systemic, holistic view** or approach is moreover emphasised by the students at UoC, NMBU, and UNISG – MOG, while UCH and NMBU students also mentioned trans- and interdisciplinarity as important for dealing with complex issues, such as those related to sustainability.

4.1.3 Own competences and competence development?

How the students viewed their own competence level and competence development, was perhaps best illustrated in their self-assessment of the five core competences included in the NextFood approach. This might also shed light on the coming paragraph on transformation, or at least as an indication of what competences changed the most according to the students' own perception. Based on the combination of all the students' self-assessments across the 12 cases, a paired, two-tailed t-test was conducted and the results are presented below in Table 2, showing a significant increase in all competences.

*Table 2: Self-assessment of the five core competences of the Nextfood educational approach across all cases (N=number of self-assessments conducted in the 12 cases, with UNISG and SEKEM reporting from two course each; Asterices indicate significance level of change: *** denotes p≤0,001)*

	Start	End	Change	Significance
Observation	4,37	6,28	1,91	***
Participation	5,07	6,91	1,84	***
Visioning	3,88	5,75	1,88	***
Reflection	4,84	6,59	1,75	***
Dialogue	4,66	6,52	1,87	***
N=14				

Visionary thinking had the lowest score at the start and end, while participation was the competence with the highest overall score, being the only competence almost at the level of "competent performer" at the end of the activities. This is indicative of how all cases catered to participatory activities and how the learners experienced being able to build this competence. Dialogue is another competence which was rated relatively low by the students at the beginning, but which saw an increase at the end. However, as will also be touched upon in the discussion of competences below, the dialogue competence was perhaps somewhat misunderstood by some learners as merely entailing "communication skills", which could nuance the results. Obviously, the results of the competence self-assessments depended entirey on the learners' interpretation of the competences and their judgement of own proficiency level.

4.1.4 To which extent transformative learning takes place?

Mezirow (2003) defined transformative learning as «learning that transforms problematic frames of reference—sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets)—to make them more inclusive, discriminating, open, reflective, and emotionally able to change.» As such, to look for transformative experiences in learners would imply looking for experiences that challenges their worldviews and understanding.

Most cases have asked the learners to fill in the 4+5 initial and final questions (according to D2.1 "Action Research Protocol"), which should provide some data to answer the question regarding students' experienced transformation. However, the diversity of how these findings were reported on in the respective case development reports poses challenges for cross-case comparison. Nevertheless, there are some findings that are recurring based on what the cases have collected from their students' experiences and narrations.

To identify transformation in learners in action learning courses is a difficult task, something the cases' reporting reflected. Whether an experience has been transformational or transformative arguably requires a deeper personal change, as also highlighted in NMBU's case development report. To read from student responses if values or other "inner worldly" characteristics have changed is difficult, and cross-case analysis of such reporting is no easy feat either. Nonetheless, it can seem as though students in several of the mentioned cases underwent a change in perceptions and attitudes, if not on a deeper level, perhaps, a transformational seed has been sown in many.

The reports from CIHEAM, UCH and NMBU suggested interaction and deep, "real-world" engagement beyond institutional barriers as integral for transformation to happen. For example, the UCH team reported how some of their students expressed distrust in their past educational experiences based on their now experiential learning environment, their interactions with stakeholders in the field and how the theoretical knowledge from their academic background, not necessarily harmonised with the farmer's reality.

> *"Students experienced a process to question their professional background, and also the educational system in which they were immerse. There were few conversations during the sessions, in which students manifested their concern about "wasting their time" and wondering if what they have been studying, and the way they have studying it, was the correct one. For example, one student after session 4, in which a stakeholder talked about his story on how he acquired his knowledges under experiential learning, said "I'm thinking, while I'm talking, I'm still emotional from your talk (to the stakeholder)… this distrust of my training came to me, it made me distrust what is happening…. These stories of the countryside, of effort, where the true value of life is seen…that is what make sense to me now" (Student 5_notes from Session 4_2021)."* (UCH_CDR_2022)

Furthermore, UCH communicated that perhaps self-questioning is the biggest transformation that the students underwent, as they learned to critically examine their assumptions and experiences in relation to the systems they work with, their inner worlds and the process of learning. This resonates with the findings from UNIOR and UoK where the students "started to critically evaluate the learning pedagogy they underwent in the previous years by comparing it with the educational activities the course provided." (UoK_CDR_2022) and where the course was said to be "a wake-up call" for action. At UNIOR the students seemed to experience a change not only in how they perceived the learning environment but also how they became more autonomous and less reliant on the teacher. One student from UNIOR wrote:

> *"Many times at the end of a meeting, I regret that I did not have the chance to enjoy such an approach during the 4 years of student life. Maybe I would have been more motivated to learn more for certain subjects that I didn't like at the time." (LRD_S10_ 2021)"* (UNIOR_CDR_2022)

At Skogforsk, the learners seemed to experience this type of change in perception towards learning, and one learner is quoted saying that they were initially hoping for "the older way of teaching" and they were worried about wasting their time. However, through the course the learner gained hope, joy and a "greater belief in [themselves] and what [they] stand for in the issue of forestry" (Skogforsk_CDR_2022). In this regard, one could argue that the students in many cases underwent some change in

mindset throughout the courses. This seemed to also be the case at AFS/IHUl. Reportedly, the students transformed their frames of reference, and were able to "engage in a different way". On the other hand, the AFS/IHU case also recorded a dramatic transformation in two of their students as their experiences in the course led them to understand how a career in agriculture is not for them, which it was possible for them to see only through their first-hand experience with the realities of the profession.

Students at SEKEM, Skogforsk, NMBU and other places, experienced transformations in their ability to work in groups and communicate with others. At UoK, the students developed their social skills and group behaviour, and at ISEKI and Skogforsk, the learners became increasingly confident. In the latter case, the learners voiced that reflection had a large impact on them. This rings true at NMBU as well, where the students spoke of "the power of the competences" and their role in enhanced understanding and personal growth. In this regard, for a number of students dialogue had a transformative effect on communication and group work, while reflection led to new insights and realisations.

"The only thing I think has influenced me has been the reflection, it has probably made me able to think about things that were said at the meetings and adjust my opinion in comparison with if I did not reflect." (Respondent 4 in Skogforsk_CDR_2022)

4.2 To what extent does action learning enhance the students' competences?

The action learning activities have had wide-ranging effects on the students' learning and development in the different cases. Below, each competence is reported on separately. Even though some cases are not mentioned in the results, this does not necessarily mean that their learners didn't experience the practice of the competence as described. Cases were included in this section depending on the quality of the data, the reporting from the case, and our understanding of how the authors of the case development reports have formulated their findings.

Some cases have written quite little about their learners' experiences with the competences, which could mean that they don't have the data to report on this, but it could also mean that it was hard to extract reliable findings from their data.

4.2.1 Observation

The students' experience of fieldwork or casework was an important opportunity to practice and enhance their proficiency in observation, according to most cases. At the Master of gastronomy (MOG) course at UNISG, for example, one student spoke of the "simple power of observation" when learning from the environment. Students also experienced being able to observe without bias and while suspending judgement, (CIHEAM, NMBU and UoK). At AFS, the students appreciated being able to experience first-hand what was previously only known to them through theory. At UoK, students—through observation walks—experienced the benefit of starting with the phenomena (rather than theory). This exercise was important as it increased their understanding of the competence. Similarly, students at Skogforsk and NMBU

experienced the observation walks as essential to train their ability to observe, and they built the competence by afterwards sharing and talking about their observation experiences. This made the learners aware of the benefits of the observation competence (Skogforsk). In the same regard, learners at Skogforsk, UoK and NMBU deliberately combined observation with reflection in different situations to train the competence of observation further and to process and capitalise on the observations. Reflecting after observing also helped the learners at UoK to understand the difference between observation and reflection competences.

In general, it seemed as if many students valued observation exercises such as the observation walk, and these were important to instil in them a sense of understanding of how to practice observation. In addition to the “observation walk” cases already mentioned, also ISEKI and UCH spoke of this in their report. They used paintings and videos as basis for exercises in observation. Also, other tools were used to train observation: UNIOR provided their students with an “observation sheet” for focused observation and at UoK, the students used photo novella exercises. At UoK, one student expressed that the photo novella helped them to improve their ability to think critically and analytically by “paying attention to the outside world” (UoK_CDR_2022). One could argue that exercises in observation also prompted the learners to observe without bias. However, one could still question the degree to which the learners had understood unbiased observation as distinguished from using cognitive abilities to understand a situation.

Students in the different cases also experienced how observation is linked to systems thinking and collective efforts, as individuals observed differently and emphasised different aspects of a system. Sharing different views in class and collaborating in groups was something the students experienced as important to better grasp the whole of a situation (UCH, UoK, NMBU, UNIOR). Observation was a great starting point for gaining multiple perspectives, and the students were able to experience —through sharing in plenary— how peers had made different observations of the same situation.

Most cases seemed to introduce and train the competence of observation explicitly, but as with many of the other cases, the students’ understanding of what the competence entailed varied between and within cases. For example, ISEKI reported practicing an observation exercise with the students at the first session, and they trained the competence along with the others. Nonetheless, they were unsure whether the students understood the difference between observation and merely watching. This was seemingly also experienced in other cases, as judged on how they reported on the enhancement of observation proficiency in their students. This emphasises how crucial training of the competences throughout the course can be. One student at UCH experienced that the exercise of observing a chef making a meal made them realise the complexity of observation and the importance of observing without bias. An experience that “may dispose [them] to open [their] senses more when carrying out observation work (Student_4_reflection document 2021)” (UCH_CDR_2022). Thus, these findings highlight the nuances of observation, namely, how it is different from “watching” due to its focus on reflexivity and suspending judgement, but also how it is different from reflection. As exemplified by both NMBU and UoK, reflection in combination with observation is central in order to make this distinction and reach a higher level of understanding of the competence.

4.2.2 Reflection

With regards to the competence of reflection, students at NMBU, UCH, UoC and UoK linked (structured) reflection to personal development, and to "making sense". For example, one student at UCH said that reflection "allows us to grow from mistakes, generate ideas and get to know oneself […] they allow us to expand our minds and knowledge to be better in the future" (Student_2_reflection document 2021 in UCH_CDR_2022). At UCH, the students were subjected to reflective exercises throughout the course, but they also asked for an opportunity to reflect at the end of the course in order to process the learning experience. This is similar to activities that cases such as NMBU and UNISG incorporate in their courses to support the students' development and (life-long) learning. Based on these findings, one could argue that the students in these action learning courses experienced first-hand how reflection was important for their learning. This is further supported by the findings from the UoC and the UoK cases. At UoC, one student said that "methodical reflection" never before was a part of their plan, but that now reflection helped them to understand. These findings resonate at UoK, where the students spoke of using reflection to learn from mistakes, which in turn "unfolded a new path of learning" and prompted them to recognise existing competences while also building new ones (UoK_CDR_2022). Moreover, reflection on experience reportedly helped students at UNISG-MAFS, NMBU and UoK to link practice to theory.

> *"I have probably always reflected and analysed quite a lot, but I do not always think that I do. It was good to highlight the core competences, for me it has meant that I have realized that it is useful to sometimes actually write down these thoughts and share them with those concerned. (Respondent 2)".* (Skogforsk_CDR_2022)

At NMBU, UNIOR, Skogforsk and the UNISG Master's program (MAFS), writing the reflection journal and the reflection document was important for the learners to build reflection as a competence because it enabled increased awareness and identification of knowledge gaps. As the Skogforsk report stated, the learners' logbook was an invitation to reflect as "thoughts thrive on paper" (Skogforsk_CDR_2022). Both at Skogforsk and NMBU, most learners were somewhat familiar with reflection from before, but the guided reflection facilitated more structured and deliberate reflective practice, such as written reflection. At UNIOR, the students apparently feared not being able to write valuable reflection documents, and they didn't enjoy it, although they understood the need for it. According to the case development report from UNIOR, the students seemed to appreciate being listened to and included by having to write reflection documents that in turn could contribute to developing and improving the course. One could argue that reflection can be hard to grasp and doubt whether reflection worthwhile if not understood and internalised. For example, the SEKEM, UNIOR and UoC cases all exemplified how reflection was a novel concept for many learners, and UNIOR and SEKEM reported that it was difficult for their students to reflect on their own will. According to the UoC report, reflection as a competence "was never considered by them (the students)" (UoC_CDR_2022). However, reflection in the course helped them improve their understanding, and a UoC student voiced having more clarity in communication (about their product). A similar development was also highlighted by USB case findings showing how enhanced understanding of the term "reflection" improved reflective capacities in the students.

Nonetheless, reports from cases at NMBU, UNISG and ISEKI showed that guided reflection, e.g., reflection sessions, collective reflective activities and writing a journal or a reflection document, is key to enhancing competence proficiency. For example, the UNISG- subcase MOG reported that rich pictures[1] were a helpful tool in facilitating group reflections. In general, one could say that the reported findings indicated that being encouraged to reflect is important for building competence proficiency. Notwithstanding, different understanding of the concept between individuals may affect the acquisition of the competence. SEKEM reported how facilitators encouraged students to reflect but that it was difficult and "overwhelming for them to understand and apply the reflection concept" (SEKEM_CDR_2022).

Digging deeper, the UNIOR case is an example that having students to reflect, can be challenging and create insecurity in the students. While UNIOR students felt supported by their teachers in writing reflections, one student also said that they were not "comfortable writing [their] thoughts and what [they] feel about certain situations and people" (LRD_S11_2021 in UNIOR_CDR_2022). Therefore, the introduction of reflection in an educational activity should be done with some caution. Moreover, the UNIOR case showed how teacher–student authority played quite a big role in making the students do the reflective activities, and it illustrated how the distinction between reflection and evaluation is easily blurred. Thus, the students' training of reflection relies on the learning facilitator's ability to build trust and clearly communicate what reflection is all about.

In the NMBU case report, the authors underlined how reflection is a competence that needs continuous training. The findings from the other cases also supported this. Both SEKEM and NMBU wrote about how reflection was challenging and energy-demanding for students, and that it required commitment. Moreover, a couple of NMBU students indicated that it could be difficult to recognise the outcomes of reflection. However, when applied and regularly practiced, reflection can have transformative power, as indicated in both UoK's and NMBU's case development reports. Besides, according to NMBU findings, reflection in combination with other competences such as observation and dialogue contributed to acquisition of a holistic view of a situation or system, which means that reflection fostered systems thinking competence. According to the UoK case, reflection in groups led to co-creation of knowledge, and in the NMBU case, collective reflection helped improve group dynamics. For USB students', group discussions with other stakeholders about results helped to improve the reflection competence, and at NMBU, using an individual–group–plenary model for in-class reflection contributed to bringing out otherwise "hidden" thoughts, facilitated sharing, and was helpful for idea generation. At UoK, reflection, dialogue and observation were viewed as what distinguished Nextfood courses from conventional ones. NMBU reported that their students found reflection useful when approaching complex situations and linked it to the building of systems thinking abilities. Having reflection as an integral part of the course and the learning process, was crucial in this regard. At the UNISG subcase MAFS, data from one student in particular demonstrated how reflections brought together different views and how the educational activities were targeted towards doing so. At the UoC case, illustrating how

[1] The technique of drawing rich pictures, described in Rosalind Armson's book, Growing Wings on the Way: Systems Thinking for Messy Situations (2011) is suggested for getting a shared overview of the present situation.

reflection contributed to uniting different perspectives, was very important to understand the usefulness of reflection as a competence.

4.2.3 Visionary thinking

Exercises in visionary thinking helped students to imagine a desired future state, develop a shared understanding among actors and to improve self-awareness. However, students sometimes found this competence difficult to grasp, which illustrates that guidance from teachers is needed.

Similar to the challenge of confusing reflection with evaluation, the lines between visionary thinking and "imagining the future" or daydreaming are somewhat blurred. This was illustrated in the case development reports, where many cases mentioned how it is important to introduce the competence of visionary thinking correctly, ideally in conjunction with an exercise. It is crucial for the students to experience the benefits and potential of visionary thinking first-hand, as shown by both NMBU, ISEKI, Skogforsk, UCH, UNISG and UoK. The AFS case did not have any data on this competence development and wrote: "Unfortunately we were not able to identify specific instances of visionary thinking within the student reflection logs in terms of envisioning the future of their field." (AFSIHU_CDR_2022). This may reflect insufficient emphasis on visionary thinking in the course module, which contained no exercise on visionary thinking, but may also reflect the students' lack of interest in the competence.

In the same regard, working with (external) stakeholders to identify future ideas and plans for how to get there —ideally in a casework project—, is an important part of building visionary thinking proficiency, as both NMBU, CIHEAM, UCH, UNISG and UoK did in their casework. Skogforsk also conducted a similar activity with their learners, where they created a vision for their forest and then held a group dialogue with other forest owners. Exercises and activities of this sort gave the learners important first-hand experience with the competence, which is identified as essential for all competences. Moreover, having the students facilitate a guided imagery exercise or a visionary thinking workshop (with stakeholders) was a great way to practice the competence and build proficiency, as both NMBU and UoK reported. Additionally, sharing visions through dialogue in groups was important for developing a vision, and for building the competence of visionary thinking. This is reported from both Skogforsk, NMBU and UoK. Moreover, students at NMBU found that reflecting after having completed a visionary thinking exercise helped to develop competence mastery. For learners at NMBU, Skogforsk and UoK, visionary thinking was a competence of multiple purposes, both academically and in their personal life. At Skogforsk, learners found that visioning contributed to self-esteem in decision-making and created hope for the future. One of their learners stated: *"This competence could be implemented in most contexts and situations —in everyday life as well as in work."* (Skogforsk_CDR_2022).

> *"I was amazed by what I was capable of creating in my head. I couldn't believe how easy it felt in the deep state of relaxation, to liberate my mind of its logistical barriers and just imagine. My peers shared my disbelief, and subsequent pride in our abilities. I still think it was one of the most personally powerful experiences I've had to date. (Student_433_reflection document_2021)"* (NMBU_CDR_2022)

Furthermore, NMBU, Skogforsk and UoK reported how visionary thinking provoked feelings in the learners related to pride, self-esteem, hope and ability to change. At NMBU and UNISG (MAFS), being exposed to visionary thinking as a competence was for many students an "eye-opener". Visionary thinking was a new and complex term for many students, as reported specifically by UCH, UNIOR and UoC students. To support the process of creating a future vision, UoK students apparently found it helpful to create a rich picture, which also helped them to better communicate it to others. Also, using visionary thinking collaboratively was for students at NMBU and Skogforsk important for gaining multiple perspectives and in reaching a shared understanding for everyone involved. Notwithstanding, Skogforsk reported that their learners' maturity made visionary thinking a competence which they were familiar with from before. However, visionary thinking and especially formulating a vision in words was still difficult and required follow-up and guidance. Similarly, at UCH the students didn't understand the competence at first and found it a "complex term". At UCH, as in other cases, successfully conducting a visioning exercise was important to enhance competence understanding. At UNIOR, the students apparently found the facilitators' support during the visionary thinking exercises to be of outmost importance to gain a feeling of mastery. During the last cycle, the UNIOR team included more visionary thinking exercises to train the competence, which is highly relevant since the course topic is food innovation.

"For this, the facilitators took us into the world of imagination and asked us in a relaxed atmosphere to close our eyes and imagine the ideal product. (LRD_S10_ 2021)"

"Other exercise was that through which we had to imagine our own product that we want to develop, giving details about color, size, smell, texture, ingredients, taste, etc. Although at first it seemed to me that we were being asked to do something impossible, the steps that the facilitator led us through helped us to successfully complete this exercise. (LRD_S7_ 2021)" (UNIOR_CDR_2022)

4.2.4 Participation (engagement)

Participation is reported by several cases as enhancing the feeling of commitment the students have towards "the field" —i.e., stakeholders and farmers— and group members, peers and teachers. Concrete, hands-on activities are important for enhancing participation proficiency and engagement as it creates a connection to the work. Group work with peers helps students to build participation competence. Some cases did not allow enough space for students to interact with stakeholders, which decreased their possibilities to fully participate in the field.

During the last Nextfood cycle, students at NMBU, UCH, UNISG, and UoK realised the value of phenomenon-based learning and developed through participation an understanding of the experiences (rather than theory) as the starting point for learning. Particularly the students were able to reach this understanding through real-life casework projects over a given period. According to the NMBU report, students experienced how the interlinkages between participation and the other competences contributed to their learning, as exemplified with a student reflection document speaking to how *"no formal essay or textbook convey the set of impressions, feelings and information that I perceived while being there through my own senses and personal background.' Student_430_reflection document_2021"* (NMBU_CDR_2022). At UCH, this same tendency is illustrated by how one student contrasted the needs of

the farmer with the university's requirements regarding the report they had written for the farmer. One could argue that this exemplifies the students' enhanced proficiency in participation as they were able to take into consideration the farmer's point of view as experienced in the field. Moreover, this feeling of connection or even commitment towards the farmer and their situation contributed to the students wanting to do good work and collaborate as a team. At UNISG (MOG), one student improved the ability to link theory and practice through participation and the hands-on activities contributed to feeling more "connected to the subject and the work" (St_MOG_6 in UNISG MOG_CDR_2022). Similarly, through interacting and sharing with peers in group work a student at UoK reported being able to attain more knowledge than by reading theory.

Generally, it was found in the cases that participation linked the other competences together, especially in the casework projects, as mentioned by CIHEAM, SEKEM, Skogforsk and NMBU. Dialogue and observation were the competences most often highlighting as important in that regard. At NMBU, Skogforsk and UoK, participation in the field was reportedly also important for the students to identify their knowledge gaps. For UoK students participating in group work, participation also contributed to co-creation of knowledge. As already touched upon in the above-mentioned example from UCH, also NMBU, CIHEAM and UNISG reported how the students' participation in the field contributed to developing an enhanced understanding of stakeholders' values and worldviews, which in turn can help to build trust. Also, SEKEM reported that participation improved students' ability to interact and communicate with stakeholders, and UCH spoke of an obligation or commitment to the farmer and a wish among the students that the farmers would feel comfortable with the results they were presented. At NMBU, student participation in a situation contributed to an enhanced understanding of the complex system at hand, which links participation to systems thinking proficiency. Nevertheless, some students stated that they felt ill-prepared for entering the field, as opposed to starting with theory ("having the knowledge"). Thus, it can arguably be difficult for course leaders to facilitate just the right level of "unpreparedness" in students.

As opposed to some cases such as the NMBU example above where the students felt somewhat unprepared, other cases seemed to struggle with providing the students enough space for full participation. For the students to be able to build participation competence, it is seemingly important for the teacher and the involved stakeholders to provide encouragement and space. Both in the AFS/IHU and UCH cases this is exemplified in different ways. For example, at UCH the students wanted more independence in communicating with stakeholders to connect with them directly and not through the course coordinator as an intermediary. At AFS the students were reported to have low engagement and participation throughout the educational activities. Based on what the AFS team wrote in their report, the teachers "monopolized" the relationship with the farmer and side-lined the students, which they attributed to the students taking the role of the observer and the teacher the role of the demonstrator. Moreover, a similar, almost hegemonic relationship was observed (by the researchers) between the farmer and the teacher. Reportedly, the farmers were not participating in the project to learn with the students but to help the students learn. In an interview, one farmer had voiced not having gained anything from the experience, and that the task was to "do this for the students […] They learn a lot from the farm" (ALS B, farmer interview in AFSIHU_CDR_2022).

"In the final session, students manifested as a thing to improve, that they could have more independence and more responsibilities regarding their relationship with stakeholders, they wanted to be in contact to ask the needed information, rather than having an intermediary (course coordinator). In that sense, that shows their empowerment during the experience, and how they are asking to take more responsibilities in the practical steps of the process." (UCH_CDR_2022)

To further build on this, it seems important to trust the students with important tasks, to develop their feeling of mastery and accomplishment, as reported by UNISG (MAFS). Arguably, being given the responsibility of a crucial task instilled a feeling of importance in the students that their participation was essential to the project at hand, i.e., important for the stakeholders and for the students' action research. Ideally, stakeholders will benefit from the learners' commitment through being entrusted with important tasks. It is thus important to think of how extra-university stakeholders can learn from this type of participation in education.

As also touched upon above, participation in the field contributed to the students being more comfortable and able to interact with stakeholders. This is highlighted in the CIHEAM, NMBU and UCH case development reports. Additionally, AFS/IHU proved how lack of student participation resulted in less contact with stakeholders. However, in most cases, for example, at CIHEAM, students experienced how meeting stakeholders alleviated confusion and enhanced understanding of "the method", as one student put it. At ISEKI, active participation from industry mentors stimulated the students' motivation to "do more" and as one UoK student said, "now it feels like we belong here" (Student 3_UoK_CDR_2022). Looking at the reporting from AFS, in connection to the other cases, one could argue that active participation and engagement from "all involved parties" (stakeholders, teachers) contributes to or motivates enhanced participation from students and is important to enhance competence proficiency. Participation boosts participation, as shown by how industry mentors in the ISEKI case inspired the students to engage more, while at AFS/IHU the teachers' and farmers' actions and attitudes seemingly inhibited student participation. At UoK, farmers' enthusiasm was reported to be very much appreciated, while ISEKI students motivated each other to participate more.

Another finding is that group work and collaboration with peers is important for building participation competence. This rings true at NMBU, ISEKI, SEKEM, UNISG, UoC, USB, Skogforsk and UNIOR. At Skogforsk, they experienced this by dividing the learners into smaller groups and providing them a topic for dialogue, which seemed to enhance participation. Also, at UoC working on tasks together enhanced student participation, and at UoK, encouraged peer learning made students help and motivate each other. At UNIOR, the students arguably underwent a change in attitude towards participation from being fearful to willing. The UNIOR team attributed this to many activities in groups or pairs, which supported feeling of mastery. It could also be, they argue, due to lack of social interaction because of lock-down and covid-restrictions. Moreover, a sense of community and inclusion in a group of learners can reportedly contribute to enhance engagement, as exemplified by three cases. One NMBU student wrote about feeling "emotionally involved in the course because of its participatory nature" (Student_437_reflection document_2021 in NMBU_CDR_2022), while taking walks together in the field contributed to increased participation in the Skogforsk case. At UNIOR, students were apparently fearful of participating but gained confidence to do so due to work in groups where the other members "*make the student feel in the*

comfort zone because the space within the group is a secure one" (UNIOR_CDR_2022).

4.2.5 Dialogue

Dialogue was found difficult to practice by several teachers. As a result of training, students improved this competence to a varying degree in terms of enhancing communication skills and gaining a deeper insight of the value of dialogue.

According to findings from the cases at NMBU and AFS/IHU, dialogue was linked to the acquisition of a holistic, multi-perspective view (of a situation or system). This also resonates at UCH, as they mentioned "dialogue of knowledge", where different kinds of knowledge encounter and interact. At UNISG (MOG), the students spoke of dialogue as an effective way to gain new knowledge. Through the course activities, the students at CIHEAM, NMBU, UCH and UoK increasingly understood the importance and benefits of dialogue. For example, the UoK team wrote about their students initially being unaware of dialogue as a competence for conducting (action) research, but throughout the course they developed an understanding and appreciation of this competence.

In most courses, dialogue was practiced in interaction with peers and stakeholders, as mentioned in the case development reports from NMBU, AFS, ISEKI, UCH, Skogforsk, UNISG and UoK. One student at UNISG (MAFS) was reported saying:

> *"Getting practice in dialoguing with various food system stakeholders is a skill I will carry with me into the future. I have learned that when speaking with farmers, you have to "speak their language" in order to have any chance of enabling positive change"* (St_MAFS_9 in UNISG_CDR_2022)

An important finding was how the students enhanced their abilities to listen, understand and respect the opinions of others through dialogue, as reported from both AFS, NMBU, CIHEAM, UCH and UoK. Moreover, the SEKEM case mentioned how their instructors focused on enhancing students' social skills, which in turn enabled them to use dialogue for networking in relation to their studies. Furthermore, findings from cases at CIHEAM, NMBU, SEKEM and USB indicated that their students gained confidence and proficiency in communication in general. For example, at USB the students were reported gaining self-confidence in discussion with external stakeholders.

At Skogforsk, NMBU and UoK, students enhanced their understanding of the difference between dialogue and discussion. Arguably, it is important to introduce and train the competence clearly and specifically for this understanding to emerge. For example, the UNIOR case wrote about having struggled with this in their course, as it was challenging to have the students understand dialogue and, especially, how it is distinguished from debate and discussion. In their case, the students used the terms interchangeably, indicating lack of understanding. This is, however, not necessarily linked only to the facilitation of the competence training, but also due to the large age gap between many learners and stakeholders in this case in particular, which ranged from high school level to adult professionals.

Furthermore, the reports from the shorter courses, i.e., at UoC and UNISG (MOG), indicated that it can be difficult to develop dialogue proficiency over short periods of

time. Additionally, the online model at UoC presented an added challenge for training this competence. Nonetheless, ISEKI, also having an online course, introduced dialogue at the first meeting, and it was reported having the largest increase amongst the self-assessment of competences. At least, one could argue that the students themselves felt as though they had developed mastery of dialogue, and the students seemed specifically to appreciate the interaction with industry mentors, which motivated them to "do even more" (ISEKI_CDR_2022).

In the cases at UoK, NMBU, Skogforsk, UCH and UoK, the introduction of dialogue in seemed to be both a prerequisite for and a result of a trusting and safe class environment. Moreover, the learners seemed to be able to express themselves without fear of judgement. In turn, this made communication with peers more meaningful. At NMBU and UoK, reflecting on dialogue and its implementation improved dialogue proficiency. From previous reporting, this also seems to be an overarching tendency and to be related to all competence building.

Based on the findings, one could argue that there are different levels of training and improving competence proficiency in action learning courses. In many cases, it seemed to be difficult to introduce and facilitate valuable dialogue. For cases such as UNIOR and SEKEM, this resulted in a more general enhancement of communication skills (which could include all types of communication), rather than dialogue as a **competence,** with its exploratory nature and characteristics distinguishing it from both discussion and debate (as defined in D3.1 Educational approaches). At UNIOR, the report authors mentioned how the teachers had a hard time introducing dialogue and in formulating questions for the students that could "stimulate a dialogic approach or challenging the assumptions behind a group's thinking" (UNIOR_CDR_2022). However, the students' reflection documents —though lacking in reference to dialogue— apparently entailed mentions of "many situations in which the group members are involved in discussions that involve asking questions, accepting criticism and being open-minded." (UNIOR_CDR_2022). So, even though clarity about dialogue as a competence wasn't achieved throughout the course, students' ability to communicate based on some of the principles of dialogue was to some extent improved.

Similarly, one could say that the USB case findings fall into this same category, where dialogue proficiency was evident by in how the students became increasingly active and "improved their formulation skills and often gained self-confidence for discussions with external stakeholders." (USB_CDR_2022). At AFS/IHU and CIHEAM, the students became better at listening and respecting others' views and opinions, which is also largely connected to the dialogue competence. However, based on the cases' reporting, it is unclear how the competence was explicitly trained. Thus, though it seemed as if facilitation of competence building in dialogue was challenging, in most cases the effort still affected students perceived competence enhancement, even if the understanding of dialogue was incomplete. Arguably, these findings, in comparison with what was reported from other cases such as UoK, UNISG (MAFS), NMBU and Skogforsk, indicated that continuous exercisising of dialogue and combining reflection with dialogue, resulted in an increased understanding and proficiency, not only in communication and "soft skills", but in the competence as a whole. The learners in these cases seemed to understand the difference between dialogue and discussion, and they apparently were comfortable with sharing their opinions regardless of whether peers agreed or not.

"According to results of self-assessment test, dialogue competence has a very high growth (2,87), shift from the Advanced beginner level to Competent performer and the highest statistical significance (p<0,001). These results were achieved due to regular plenary discussions and peer feedback activities, that involved all the students and forced them to express their opinions and to follow the dialogue rules." (UNISG_CDR_2022)

4.2.6 "The challenge of the whole" (systems thinking)

Not all cases analysed their student data for the competence of systems thinking. However, their reports still contained some findings on their students' ability to deal with "the challenge of the whole". In some cases, action learning and the practice of core competences helped students to develop this ability. For example, NMBU, CIHEAM and UNISG reported how casework projects in "the real world" were important for training the core competences and systems thinking. Moreover, practicing systems thinking methodology through systemic inquiry (more than once) enhanced the NMBU students' ability to deal with complexity. At UNISG (MOG), the visits to the local farms provided the students with context for systems thinking approaches. As for the core competences, both NMBU and Skogforsk reported that when their learners used the core competences with intention, contributed to gaining a holistic view of a situation or system. Additionally, cases such as NMBU and UNISG reported how making rich pictures was linked to understanding a whole system and its interconnections, and the competence of observation was again closely linked to collecting the information to inform systems thinking. NMBU, CIHEAM, UoK and USB touched upon how learning about systems thinking methodology and action learning methods served as a toolbox for students when approaching complexity during the courses.

In the courses at UoK and NMBU, working in teams of diverse individuals contributed to understanding the importance of multiple perspectives, and groupwork throughout the the course instilled in the NMBU students an appreciation of other views, i.e., "acknowledging the complexity of different systems" (NMBU_CDR_2022). For the students in these two cases, writing the reflection document was a practice in systems thinking, as they had to deal with the complexity of processing the whole course experience and their learning process. Similarly, both NMBU and UNISG reported how practicing reflection throughout the course was linked to developing systems thinking proficiency. For example, according to one NMBU student, it was the act of reflecting upon the experience of using systems thinking in the casework, not the casework participation in and of itself, that enhanced the learning about systems thinking.

In the cases at NMBU, AFS/IHU, Skogforsk, UCH and UNISG, interaction through discussion and dialogue with peers, stakeholders and teachers, was important for the students to develop an understanding of "the whole". As the AFS indicated, the multi-actor approach was helpful in gaining broad insights into complex systems.

5 The process of case development towards the Nextfood approach: findings and discussion

The results below present the cross-case analysis of the cases' reporting on the supporting and hindering forces for each of the six specific shifts. There are little or no results on how to build on supporting forces and how to overcome hindering forces, because the cases did not report much on this.

5.1 What are supporting and hindering forces for change towards the Nextfood approach with particular focus on the six essential shifts?

For each of the essential shifts, the respective sections below start with a table summarising the main supporting and hindering forces for that particular shift, followed by a more detailed and nuanced description of the results.

5.1.1 From lecture hall to a diversity of learning arenas

From lecture hall to a diversity of learning arenas
Supporting forces
stakeholders' involvement
online learning arenas due to pandemic
new learning arenas due to pandemic
students' appreciation
involvement of professors or teaching team as a whole
diversity of field sites
institutional support
Hindering forces
pandemic situation
stakeholders' lack of involvement
institutions' lack of support or resistance

5.1.1.1 Supporting forces and how to build on them

Stakeholders' involvement is most often mentioned as a supporting force for this shift. While UNISG and USB mentioned that good relationships with stakeholders are important to realize this shift, NMBU also mentioned that one teacher or facilitator should visit stakeholders (farmers) to explain the approach to the farmers before the start of the course. ISEKI had good experiences with including industry mentors during the last cycle, whose support was very motivating for several students. Moreover, Skogforsk had good experiences with having course participants hosting field visits, and thus having a course participant as stakeholder for each field visit.

Online learning arenas were mentioned by four cases (Skogforsk, UCH, UNIOR, UNISG) as a supporting force for this shift under Covid-19 pandemic restrictions. UNISG named the benefits of working across different countries and time zones:

"Online education provided several benefits such as connection between professors and the students based in different countries, and recorded classes that could be used by students several times or according to their time zone. However, the action learning approach that attracted the students suffered from lack of hands-on activities limited due to red zone and lock down period." (UNISG_CDR_2022)

UNIOR and Skogforsk also found the online learning arenas practical for sharing information and keeping in touch:

"Virtual environments that supported us in the transmission of documents (theoretical courses in digital format, instructions, supporting documents, questionnaire, quizzes, literature) or keeping the contact with the students." (UNIOR_CDR_2022)

"The [Supertext] app is a learning arena that helped fostering a (short) dialogue and further knowledge transfer, acting as proof of an increased understanding of the subject. The app helped learners as well as the Skogforsk team to be reminded of the case – to keep the dialogue alive also between meetings." (Skogforsk_CDR_2022)

Additionally, UCH referred to the Nextfood Toolbox as a great online resource to find tools to implement the approach.

Along the same line, three cases **discovered new learning arenas** due to the Covid-19 pandemic restrictions and named those as a supporting force for shifting to a diversity of learning arenas despite restrictions. UNISG and USB both mentioned that they used field sites on campus, while NMBU visited a farm close to campus at the start of the course. All three cases had good experiences with using nearby field sites, and therefore consider using these newly discovered learning arenas further in the future.

Skogforsk and UNIOR increased the **diversity of their field sites** over the past cycle and reported that that allowed for addressing a wider range of topics.

"In this case we had the opportunity to visit one of Skogforsk test sites close to Uppsala as well as different private forest properties. Thereby, we have been able to meet at different sites at each of the five meetings. This gave opportunity to find different themes adapted to each of the forests visited and we could focus on various types of questions, show good examples, and discuss different problems." (Skogforsk_CDR_2022)

"From the data collected during the introductory workshop where the students were questioned about the supporting and hindering forces as well as on the learning arenas, it was concluded that we should maintain part of the learning arenas present in the first cycle but also include new ones that could better support the learning process. Thus, the learning arenas ranged from the usual lecture hall, laboratories, didactic farm of the faculty, field trips in specific locations (Bicaci bakery, Silena SRL- restaurant) to virtual environments that supported us in the transmission of documents (theoretical courses in digital format, instructions, supporting documents, questionnaire, quizzes, literature) or keeping the contact with the students.

In addition to these learning arenas, the students were also present in the conference hall of the Academic Library (for competitions) found in the main campus, the didactic farm (to work with two technological lines of producing dairy products and bread), the canteen of the university and Silena restaurant where they could prepare the food products under the guidance of a chef." (UNIOR_CDR_2022)

Students' appreciation was mentioned as supporting force by three cases (CIHEAM, NMBU, UCH). NMBU formulated that as follows:

"The students' appreciation of field trips and interactive classroom sessions thus emerged as supporting forces for including a diversity of learning arenas in the course." (NMBU_CDR_2022)

The Professors or teaching team were also mentioned by three cases as a supporting force (AFSIHU, UCH, UoK), be it for a diverse set of reasons. While AFS/IHU regarded the opportunity for students to interact closely with Professors during different stages of their research as a supporting force, UCH focused more on the interdisciplinarity of the teaching team and its motivation to experience a new way of teaching. Along the same lines, UoK mentioned the open mindedness of the team and the team's ability to accommodate criticism, make joint decision and share responsibility.

Institutional support was mentioned as supporting force, by CIHEAM and UoK, either to build up the necessary human capital (CIHEAM), or for administrative support and a good contact in general (UoK).

5.1.1.2 Hindering forces and how to deal with them

The most important hindering force was the **pandemic situation**, but cases found multiple ways of dealing with that situation. CIHEAM and UNISG both used web-cases and virtual farm visits during the last cycle,

Skogforsk, UoC and UoK could count on the flexibility of staff and modern technologies to absorb some of the negative impact caused by the restrictions and implement a plan B when necessary:

"In the current online course, we avoided powerpoint presentation and used break out rooms, field visit in student's respective location, role play, group work etc to make the learning process activity-action-reflection based." (UoC_CDR_2022)

Several other cases also mentioned changes of plans. UCH mentioned the additional time needed to organize field visits complying with Covid-19 restrictions, and that *"The virtual context restricted some of the proposed exercises, so these had to be adapted. (Teacher reflection document, 2021)"* (UCH_CDR 2022). UNIOR needed to postpone action learning until face-to-case meetings were possible and organized several meetings with only one group instead of four groups, and organized field visits in small groups of students:

"Thus, from the moment of organizing the introductory workshop on the main shifts to necessary to embrace the action learning approach, we waited for a few weeks until to start the course on-site due to the restrictions regarding face-to-face meetings. We made the compromise of postponing the beginning of the course because both teachers and students were convinced that the on-site learning is more valuable than on-line learning when speaking about the action-learning approach." (UNIOR_CDR_2022)

UoC mentioned that students were shy to put their videos on and to interact with each other, while at USB, the online setting led to numerous absences of both stakeholders and students. These challenges were difficult to overcome.

Less important hindering forces where the **lack of stakeholders' involvement** (NMBU and ISEKI) and the **lack of institutional support** (AFSIKU and UCH). NMBU mentioned that visits to stakeholders should be a semi-safe learning space, and that therefore, the teaching team should know the stakeholders well enough and explain the approach to them. ISEKI had only two out of five industry mentors join the online training but had satisfactory interactions with those two. While AFSIHU is challenged by lack of availability of financial resources and professional networks when the project ends, UCH faces the challenges of a template for course programs that does not fully allow implementation of the complete Nextfood approach, and institutional resistance to change.

5.1.2 From lecturing to co- and peer learning

From lecturing to co- and peer learning
Supporting forces
good size and skills of the group of teachers or facilitators
diversity in students' group
non-hierarchical structure, openness and building trust
Hindering forces
challenges for students to adapt
conflicts amongst students

5.1.2.1 Supporting forces and how to build on them

A **non-hierarchical structure, openness, and building trust** is a supporting force**, for teachers or facilitators, stakeholders and students alike** (USB, Skogforsk):

"By showing the learners that we are interested in their thoughts and questions, the team succeeded in creating a good and inviting atmosphere, where everyone felt they could learn and contribute.

'We have been clear that there is no ranking, prestige, or stupid questions. This mindset has created openness and honesty among most of the participants.' (Member of the Skogforsk-team)" (Skogforsk_CDR_2022)

Time to reflect and discuss during each meeting and time for group meetings are also important for all (UCH)

For **teachers or facilitators**, the **size and skills of the group** seemed important. CIHEAM mentioned the higher number of staff involved as supporting force, and UNISG the presence of two facilitators with appropriate skills. UoK mentioned keen observation by mentors, and follow-up suggestions for group activities, and UNIOR named the presence of a stakeholder with experience in each group as well as of students in the final year of the Master programme as important to shift to co- and peer learning.

UNIOR was the only case that mentioned **stakeholders** as supporting force for this shift:

"In the same manner, the teachers' and stakeholders' documents mention how the stakeholders acquired pedagogical skills and became more familiar with making presentation, adapting their vocabulary and ways of expressing themselves so that they could be easily understood by both high school and university students." (UNIOR_CDR_2022)

Diversity in the **students' group** was a supporting force mentioned by three cases. At NMBU, diversity in the group had a positive effect on peer learning, as mentioned by one student in a conversation with a teacher. UoK also mentioned that when screening candidates, the multi-disciplinarity in the group should be taken into account. At Skogforsk, the wide age-span, a gender-mix, different educational and professional backgrounds, and varying experience in forestry within the group supported peer learning:

*"*In this group there was an exciting interaction between everyone's background and experiences that made us all develop at some stage.' *(Member of Skogforsk-team)"* (Skogforsk_CDR_2022)

5.1.2.2 Hindering forces and how to deal with them

Challenges to adapt were a hindering force amongst **students** in five cases (NMBU, Skogforsk, UCH, UNIOR, USB), particularly amongst students coming from a traditional education system. UoC mentioned challenges to adapt amongst **teachers** as a hindering force for this shift.

Conflicts amongst students was named by four cases as hindering force for co- and peer learning (NMBU, SEKEM, UNISG, UoK):

"It was some uncertainty among the teachers of how to facilitate conflict management in the student groups, which potentially could act as a challenge for co- and peer learning. A consideration would be to take a course or somehow build competence in the facilitator team on conflict management (Teacher reflection_S08_2021)." (NMBU_CDR_2022)

"Sometimes the students in the biodynamic course face difficulties in dealing with each other specifically between older and newer students, and male and female students. The way to deal with such difficulties was to keep insist on mixed group members and solve insistently any conflict that could arise during the assignment. For the entrepreneurship program there was significant challenging, however, the participants were tending to work on their projects individually." (SEKEM_CDR_2022)

Skogforsk also mentioned that some participants felt pushed into a corner, which was not easily overcome by the facilitators:

"The topic of this course has recently been and still is the subject of a rather polarized debate in the media and politics. This means that questions about how we should use our forests can sometimes be delicate to discuss.

In this case our learners were a group of forest owners with special interest in alternative forest management methods and nature conservation and two forestry officials employed at the forest owner's association. The officials participated in their professional role as advisors and their main task is to buy wood for the forest industry. This sometimes put them in a difficult situation, as they need to act as professionals and according to mandates from their employer. This problem was expressed by one of the officials, and also one of the learners addressed this in

the final reflection document, as something that could hamper the dialogue in the group. We need to have this aspect in mind if we want to arrange this kind of activity again. Perhaps it would be better to arrange separate courses with one category of learners in each group." (Skogforsk_CDR_2022)

5.1.3 From syllabus to supporting literature/a diversity of learning sources

From syllabus to supporting literature/a diversity of learning sources
Supporting forces
providing students with a bibliography and links to other sources
technical, online solutions
students' learning along the way
everyone's motivation
Hindering forces
teachers finding a syllabus convenient
lack of clear instructions from teachers to students
challenges for students to find and use sources
students' diverse levels of understanding
institutional constraints

5.1.3.1 Supporting forces and how to build on them

Providing students with a bibliography as well as links to other sources was a supporting force for the shift from syllabus to a diversity of learning sources for three cases (ISEKI, UNIOR, UNISG). For example, ISEKI led students take the initiative to develop an online library:

"the suggestions for improvement included i) asking students to provide a bibliography or to present an article in an online session and ii) having teachers provide supporting literature or connections with citizens and society instead of literature. To accommodate these suggestions, students provided a 'bibliography' of their interest when in the introductory online session they worked in random breakout groups to decide on an article, presentation, or report that they would like to know more about including a suggestion for who to contact to learn more. Furthermore, the suggestion to connect with society was accommodated with the requirement of student teams to work with a mentor in industry rather than one in academia." (ISEKI_CDR_2022)

UNIOR started with a literature list made by the teachers and stakeholders, and then encouraged students to also consult other sources:

"The topics included in the courses (18 topics) were selected carefully by the teachers and stakeholders since the first cycle and they were in accordance with the stages that a product must follow from the stage of idea until it is released on the market.

The theoretical information related to the 18 topics was sent in digital form to the students, being accompanied by specific literature (digital/printed). The students were also encouraged to study in the academic library and they have got recommendations on scientific papers, books, catalogues, databases, etc.)" (UNIOR_CDR_2022)

Technical solutions were mentioned by three other cases (NMBU, Skogforsk and UoC) as supporting force, for example using the Supertext app and email to share links to sources (Skogforsk), using online resources (UoC), and using mobile phones for direct sharing of information in class (NMBU):

"In a student-led session, a student group used mobile phones to interact and receive feedback in the classroom session. The responses came up directly on the screen, and it seemed to work well (Teacher reflection_S10_2021)." (NMBU_CDR_2022)

Students' learning along the way was mentioned as a supporting force by UNISG, UoK and USB:

"Here we observed students progress over time, in fact, they showed an improvement of their knowledge base and research abilities, which were later reflected in the improvement of the presentations delivered. Young generations nowadays are very much IT oriented, which was supportive during the online phase, which should be further exploited in the coming year." (UNISG_CDR_2022)

"Adaptive learners: Learners easily adapted to the nature of the course. They were not provided with a fixed curricula and most of the sessions were activity based, but students tried to cope up with the new learning technique. Appreciating efforts of students/ innovativeness is important in introducing diverse learning sources." (UoK_CDR_2022)

and **everyone's motivation** was mentioned as supporting force by UCH and AFSIHU. AFSIHU explained this as follows:

"It was reported in the ALS observation logs that most students were observed to engage in meaningful and constructive conversations that allowed them to exchange ideas they found in the literature. Brainstorming between participants during the discussions inspired students to look for more related bibliography on the topic under investigation after appropriate prompting by the teachers. Students, in most cases, needed considerable support in searching sources and particularly in using research search engines. However, all the teachers were supportive on this front and encouraged their students to further their research. This opportunity was taken up by all students who were willing to leave the security of the textbook and to respond to the demands of their project." (AFSIHU_CDR_2022)

5.1.3.2 Hindering forces and how to deal with them

The cases showed less agreement in what the hindering forces to this shift were.

Teachers finding it convenient to use a syllabus (UoC) because they have been striving to create a stable and clear syllabus for the course over the previous years (SEKEM) was mentioned by two cases as a hindering force to moving away from a syllabus.

While **institutional constraints** were mentioned by UNIOR as major hindering force:

"One obstacle that remained since the first cycle is the impossibility of the department to change the syllabus due to certain limitations imposed by the Ministry of Education or to introduce the course as it is in a study programme. However, the methodological part regarding the action learning approach can be embraced by any teacher who would like to make a real change in the teaching/learning method." (UNIOR_CDR_2022)

A **lack of clear instructions** from teachers to students on how to go about finding and using diverse learning sources was mentioned by both NMBU and USG:

"From the teacher reflections it appeared that there was a challenge to make the students understand how to conduct the literature seminars, and thus a need to give clear instructions; to point the direction of what type of questions to ask and give a clear structure for the process of developing those questions (Teacher reflection_S04_2021)." (NMBU_CDR_2022)

"Another hindering force was perception of some of the sources by some of the external experts or teachers. This is more question of different approaches of different generations, as for younger people some of sources are relevant and easy-to-use, but the older stakeholders don´t perceive them as suitable or trustworthy (e.g., some of social networks and medias) and at the same time have in some cases technical difficulties to use these sources. Looking for user friendly information sources will be a way forward as well as applications." (USB_CDR_2022)

Challenges for students to find and use diverse learning sources were also pointed at by other cases when they described the hindering forces for students. AFSIHU mentioned that students need to further develop their **literature searching skills**, and UCH also found that the lack of exercises related to analysing literature was a challenge for students. AFSIHU also mentioned that students lacked the necessary **language skills** to find and read literature in English, something that the case leaders think can be overcome by making English language lessons widely available and obligatory, and by clarifying field-specific terminology in English:

"Another hindering force related to language was mentioned by a student (ALS C, S) when she mentioned that she had trouble understanding the articles that they were given to read because the language was too complicated and "scientific" for her level. The professor offered extra support for deciphering the information and helping to decode the useful material. This seemed to work well." (AFSIHU_CDR_2022)

Students' diverse backgrounds –and thus diverse levels of understanding, be it due to language or academic skills— was mentioned by SEKEM and UoK as a hindering force:

"Difficulty in understanding/differences in academic knowledge level of students: There was an observed difficulty in adequately understanding the concept of agroecology using supporting literature, because learners were from diverse background. Allowing more time for students to read articles and giving them e a second chance to present review." (UoK_CDR_2022)

5.1.4 From textbook to a diversity of teaching aids

From textbook to a diversity of teaching aids
Supporting forces
online learning environments
wide range of diverse teaching aids developed over the years
Hindering forces
lack of sufficient time to develop or select new teaching aids
students being insecure to use a diversity of teaching aids

5.1.4.1 *Supporting forces and how to build on them*

Online learning environments was mentioned by six cases (UNISG; Skogforsk, UCH, UNIOR, UoC and UoK) as a supporting force for the shift from textbook to a diversity of teaching aids. At UNISG, for example, the online learning environment prior to the field visits spurred students to collect information before the field visit. The field visit then gave an additional positive impulse to the search for additional information. UoK made an online repository of tools that can be updated and used in future cycles too. Skogforsk made films in preparation of each field visit and used the Supertext app to share those and communicate between field visits. UCH also mentioned that the online learning environment that started due to the Covid-19 restrictions was a supporting force:

"Virtual context allowed the teaching team to include videos and technology in the learning environment (Teacher reflection document, 2021)" (UCH_CDR_2022)

Having developed a **wide range of diverse teaching aids** over the past cycles in the Nextfood project was mentioned by two cases (UNIOR and UNISG) as supporting force, and they added that this is a supporting force to build further on in future cycles.

"In the second cycle there have been used several teaching aids, ranging from texts in digital format (word or ppt.), worksheets, quizzes, evaluation sheets, projects to using innovative technologies like smartboards, videos illustrating technological processes, mobile applications (whatsapp groups) that supported the communication among the students and platforms (Microsoft Teams) where the students could find resources or upload different materials. During the course, a serious boardgame (e.g. Simplycycle – on the importance of choosing the right materials for packages) was used and in the laboratories students had access to specific equipment such as: microscope with video camera, spectrophotometer and technological lines.

The role of all these teaching aids was to make the learning process easier, more interesting, dynamic and efficient." (UNIOR_CDR_2022)

5.1.4.2 *Hindering forces and how to deal with them*

Lack of sufficient time to develop or select new teaching aids was mentioned by three cases (UNIOR, UNISG, UoK) as hindering force for this shift.

"One obstacle is the lack of time that should be allocated by the facilitators to develop new methods, instruments and supporting materials for their course (questionnaires, quizzes, observation sheets, etc.). However, all the teachers involved in the project were actively involved in this process and shared their materials with other colleagues from the faculty." (UNIOR_CDR_2022)

"Selection of the teaching aids for pre-course assignment, balance between their quantity and quality and their compatibility with learning objectives of each course are the most challenging points for identifying appropriate learning sources. More time dedicated to the selection of the right sources could be a solution for this hindering force." (UNISG_CDR_2022)

This shows again that time is a recurrent hindering force to implement the Nextfood approach.

(Students were insecure to use a diversity of teaching aids because they are not used to use something else than a textbook at AFSIHU and SEKEM, which hindered the shift to a diversity of teaching aids. AFSIHU suggested that this can be overcome by introducing students to research articles in English earlier on in their studying careers:

"Students have reported in the past that it is a source of insecurity to leave the textbooks and venture in a vastly growing research pool. Research articles are often confusing; with difficult language and students feel unconfident about their validity (ALS D, S). They seem to need considerable support in this domain and the amount of this support means time and effort resources for their professors.

Dealing with this shortcoming is in most cases a matter of exposure from early in their academic career. That is, students are only made familiar with research methods and skills in a serious manner when they write their dissertations and this might be too late. If they follow a structured research skill program from earlier on they would be able to produce better assignments, become more confident researchers and bring more knowledge to the learning environment." (AFSIHU_CDR_2022)

This hindering force is related to the one named under the shift from syllabus to a diversity of learning sources, namely that students are not familiar with searching and selecting relevant literature, or lack the necessary skills to understand the sources, be it due to a lack of English language skills, or academic understanding. USB mentioned in that regard that **students selected irrelevant materials**, and that not all participants were on the same line as to which teaching materials to use:

"Some of the methods were difficult to adopt by all involved persons (more often by the external stakeholders and farmers), also the materials provided by students have very different quality and relevance and, in some cases, it is time demanding to find out, if the material is useful for our purpose. Going forward to allocate more time to certain activities to allow the involved persons to understand. To ask students to submit the materials earlier so that material quality and relevance can be checked. To organise short brief seminar and actively practice with students on how to search for quality material as well as to suggest material sources but not limiting the students." (USB_CDR_2022)

5.1.5 From written exam to a diversity of assessment methods

From written exam to a diversity of assessment methods
Supporting forces
final group presentation at the end of the casework
time to establish new assessment methods over the years
Hindering forces
difficulties to let go of the traditional methods (teachers and students)
unclarities about what evaluation entails
voluntary participants not easily filling in forms

5.1.5.1 Supporting forces and how to build on them

Time is a crucial factor for this shift as well. UNISG pointed out that thanks to experiences from previous cycles, different assessment methods were already in place. Thus, less time was needed to implement this shift in the last cycle. Moreover, time was spent prior to the course to develop assessment methods within the teaching

team. **Time spent earlier on establishing new assessment methods** is thus a supporting force.

"Different types of assignment were used as assessment methods: group slides and presentations, individual assignments (papers), stakeholder documents, tests and written group assignments, Portfolio (reflection journal and community portfolio). All these assignments were a part of the co-design process and a result of discussions with guest professors. This was a supporting force for this shift." (UNISG_CDR_2022)

A final group presentation at the end of the case work, with several stakeholders attending and where students have to adapt to stakeholders' reality was mentioned by three cases (CIHEAM, NMBU, UCH) as a supporting force for this shift because it motivates students and stakeholders alike. They added that including this final group presentation as part of the assessment, enhances learning and prepares students for work-life.

5.1.5.2 Hindering forces and how to deal with them

Unclarities or doubts from the teachers' side about how to evaluate certain aspects, or lack of understanding of an assignment from the students' side, is a hindering force to having a diversity of assessment methods. This is certainly the case for the reflection documents, particularly in cases that recently started implementing the Nextfood approach. The lack of specific criteria to evaluate students' reflection documents was a challenge at UoK, and guidelines need to be developed to overcome this challenge. UCH's students had not fully understood what the reflection document entailed and knew that it would not be graded, and thus did not deliver it on time. UCH's teachers had doubts on how to evaluate learning outcomes.

Such uncertainties can lead to another hindering force, namely **difficulties amongst especially teachers, but also students, to let go of the traditional methods**. This was named by four cases (AFSIHU, CIHEAM, UNISG, USB). CIHEAM wrote, for example, that *"the changing and adaptive nature of the assessment methods is something the students resist"* (CIHEAM_CDR 2022).

At ISEKI and Skogforsk, the two cases in which the participants participate **voluntarily**, participants **did not easily fill in the evaluation forms and self-assessments** at the beginning and end of the course, even though those are part of the assessment. Skogforsk then noticed *that "minimizing take-home assignments and making those time efficient helps"* (Skogforsk_CDR 2022).

5.1.6 From lecturer to learning facilitator

From lecturer to learning facilitator
Supporting forces
teachers having already become facilitators
being in a group of facilitators
having enough time to be involved
non-hierarchical dynamics inherent to the approach
good communication between participants in groups
Hindering forces

group work facilitation being particularly challenging
not enough time to change the mindset of students and teachers
students needing much time to become confident enough to interact with facilitators

5.1.6.1 Supporting forces and how to build on them

Teachers already being or having become facilitators by the end of the project, was mentioned as main supporting force for this shift by five cases that have been part of the Nextfood project from the start (CIHEAM, UNISG, Skogforsk, UNIOR and USB). At CIHEAM and UNISB, high(er) involvement of staff and enough **time** to be involved, and consequent readiness and willingness of Professors to be involved (UNISG), supported this shift. Also, at Skogforsk, most experts and researchers were used to act as facilitators in different situations before the start of the project already:

"Important factors to succeed as a facilitator is to be able to build trust within the group and to make sure that everyone is heard, to highlight those who are a quiet and support them by actively including them in dialogues and activities.

In our team we could benefit from that most of the experts and researchers at Skogforsk are used to act as facilitators in different situations. During the process the teachers have become better at including all learners and to make sure that everyone is involved by asking questions and actively give the word to individuals that have been quiet on previous meetings." (Skogforsk_CDR_2022)

UNIOR benefitted during the last cycle from young, open-minded staff:

"The change of position from lecturer to that of facilitators was not on easy process not even in the second cycle. However, this time we selected young teachers that were more willing to change something in the way they delivered their courses or labs." (UNIOR_CDR_2022)

USB noticed that those who had been involved in previous cycles had become (better) facilitators in the last cycle:

"The role of facilitator is difficult for some of the teachers or external experts, but it was visible, that those of them, who already participated on this approach, are able the handle it much easier. Going forward we will continue collaborate with teachers and externals that have already been part of the course and also involve new teachers but introduce facilitation more in detailed to them at the beginning. Helpful was also short example during planning meetings, where we tried to introduce this role to the stakeholders new in our course. Later during the course, this approach is appreciated by the students and leads to their higher activity and better communication as well as it appreciated buy the teachers and external experts." (USB_CDR_2022)

NMBU, Skogforsk and UoK specified further that being a **group of facilitators** supports the shift even further, because of peer feedback and learning (NMBU), the complementarity within the group (Skogforsk), and the good teamwork (UoK):

"For the facilitators it was positive to be in a group of facilitators, to discuss challenges and what role to take. The role was described as to connect students and teachers, back the teaching team, share former experiences of being students, clarifying tasks and process for the students (Teacher reflection_December__2021)." (NMBU_CDR_2022)

"It was also positive that the Skogforsk team consisted of individuals with different knowledge, skills, and experiences. In addition to the expert of nature conservation, one of the facilitators have practical experience from working as a machine operator and another has a background as teacher. This gives credibility to the team." (Skogforsk_CDR_2022)

"Team work: good communication and organisation within the team is very important in materialising the intended shift of being a facilitator. Developing a good work culture and focusing on capacity building can reinforce this transition." (UoK_CDR_2022)

The non-hierarchical dynamics inherent to the approach, are another important supporting force (UCH, UNIOR):

"It was kept the rule as the floor to belong to the students and stakeholders and not to the teachers. A method name 3B4ME (three before me) was introduced so that the students not to ask the questions directly to the facilitator but to try to find the answer from other sources (to ask the colleagues in the group, to ask the stakeholder and to look for the answer in books, on internet, etc.). Only if these three sources are not reliable enough they should ask the teacher. The students got used with this rule and little by little they succeeded in becoming independent learners." (UNIOR_CDR_2022)

NMBU built further on this supporting force during the last cycle and tried to **do away with the traditional hierarchy** in education. This was perceived as a supporting force too:

"Two PhD-students of the faculty, who were also facilitators of student groups, participated in one reflection session with the students. Teachers said that it contributes to building a learning community and to 'flatten' the hierarchy, and that it was a nice experience (Teacher reflection_S04_2021). Students expressed a wish for the teachers and facilitators to be more actively involved in reflection sessions (Teacher reflection_December_2021). The teaching team discussed whether it was feasible to combine facilitation of and participation in sessions and noted that most reflection sessions are focused on the students' experiences. It could be considered to have teachers involve in the reflection sessions in the literature seminars, as done in earlier years. However, that was also a question of the teachers' capacity, and of to what degree the teachers should integrate with and get to know the students. (Teacher reflection_December_2021)" (NMBU_CDR_2022)

ISEKI also tried to do further away with that hierarchy, and asked **stakeholders** (external experts) to not only present, but also **interact with students**:

"To improve the shift from lecture to learning facilitator, the suggestions from the cycle 3 Reflection Workshop were to include inviting experts to not only present but to interact with students. Thus, in two sessions, 'Virtual Visit' and 'Student Suggestion', there was participation of industry and/or academic experts and, in both sessions, random breakout groups for students to work together preparing questions and comments for the experts. Following, a guided interactive session led to a true conversation among the students from different teams and the invited experts." (ISEKI_CDR_2022)

Both AFSIHU and UCH focused in their facilitation on **good communication** between the participants in groups. This supported the shift from teachers to facilitator further with students gradually becoming more confident to express their thoughts, thanks to the Professors opening up for that dynamic too.

5.1.6.2 Hindering forces and how to deal with them

Hindering forces for the shift from lecturer to learning facilitator, are mainly **institutional**. A strong **mindset** on the traditional educational hierarchy is not easily altered, both from teachers' and students' side (UCH, UNIOR). It indeed takes **time** to change mindsets. UNIOR mentioned that one should allow teachers time to get used to and train themselves in being facilitators, including reading literature and having group discussions about facilitation. UNISG also stated that teachers *"have no time to*

reflect, nor personal presence to interact with students". Critique and hesitance from colleagues-lecturers, was a challenge that UoK faced when trying to implement this shift and change mindsets. UNIOR and USB, however, found students to be still hesitant to interact with facilitators, despite teachers having become facilitators. UoC suggested that teachers need to redefine their tasks in order to implement this shift.

All these findings from different cases indicate that **changing a mindset takes time, and that especially facilitation and becoming a facilitator takes time**.

Facilitation of group work was named as a challenge by three cases (NMBU, CIHEAM, Skogforsk). Both CIHEAM and NMBU mentioned that facilitators should guide processes with all groups in similar ways, and NMBU specified that individual facilitators should have a clear role description and guiding template for the process:

> *"Regarding the implementation of facilitators for the student groups, the teachers and facilitators questioned if it was a good idea and whether it was taken too fast from thought to action (Teacher reflection_S08_2021; Teacher reflection_December_2021). It took time and resources to have a facilitator for each group, and as there were no guiding template for the process it was also difficult for the facilitators to know what their role was supposed to be. One potential problem mentioned was that the students could think they would get a good grade if they simply followed the facilitators' advice. Still, the implementation of group facilitators could be seen as a pilot, and an action to learn from. Teachers noted that the further discussion of this measure should touch upon how close the facilitators should be to students, and how much space students should have to figure things out for themselves. Moreover, that they should communicate to students that they cannot facilitate everything for them; that the learning process is more about bringing the inside out than the opposite."* (NMBU_CDR_2022)

Skogforsk's facilitators found it challenging to stick to the plan and timing when participants were very engaged, and to make sure that participants who missed a session became well-integrated in the group.

5.2 What does a change to the Nextfood approach require?

> *"Flexibility, a lot of flexibility, open mind, a bit of courage, good planning and institutional support."* (UNISG_CDR_2022)

UNISG summarized well what such a change requires from teachers, students and institutions. But this can be specified further.

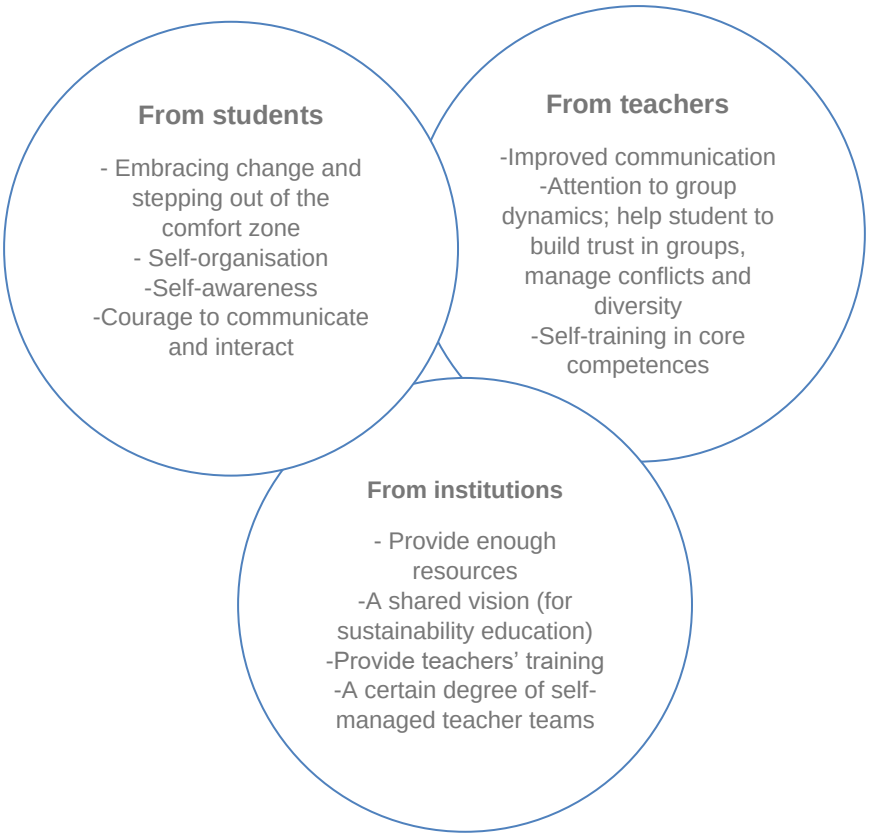

Figure 1: What the change requires from students, teachers and institutions

5.2.1 From teachers or facilitators

From teachers, the change requires **becoming a good trainer or facilitator**. No less than seven cases mentioned this in their case development report (NMBU, AFSIHU, SEKEM, Skogforsk, UCH, UoK, USB). To become a good facilitator, one should

- be better at communication (USB)
- build group dynamics amongst the students (NMBU)
- participate actively while facilitating (NMBU, according to students)
- train oneself in reflection (AFSIHU)
- help students to overcome the social challenges such as different languages and interpersonal misunderstanding (SEKEM)
- build trust in the group (Skogforsk)
- build the core competences and keep it simple (Skogforsk):

"Action learning should be fun, and we need to approach the group of learners by connecting the how and why to their own situations. Use an easy language adapted to the target group to make the approach more accessible to the learners.

Create easily understandable situations and a good metaphor for the different competences.

'It's better to explain them observation based on how you buy tomatoes rather than on the Hubble telescope.' *(Member of the Skogforsk team)"* (Skogforsk_CDR_2022)

However, the change requires more from teachers, namely:

- Flexibility and adaptability, embracing change, self-awareness (NMBU, UNISG, UCH)
- Good planning and time management (UNISG, UCH)
- Create a well-functioning team of facilitators with complementary competences and skills (Skogforsk, UCH)

"[A] first step is to identify the colleagues that are willing to get involved in such an educational endeavour which means: being a facilitator (guiding the students), teacher (delivering information), researcher (collecting, processing and interpreting the collected data). The data showed us that it is not easy as a teacher to perform all these tasks alone but in collaboration with other colleagues due to the huge amount of information that must be analysed, processed and interpreted. More than this, the activities of a teacher are diverse and sometimes one person doesn't have all the competences and information to do them all."

(UCH_CDR_2022)

- Being curious (Skogforsk)
- Understanding that it takes time for the students to internalize the approach (NMBU)
- Giving students clarity, for example about the paradigm shift (NMBU, UCH)
- Contribute to a good learning environment (NMBU; according to teachers, AFSIHU)
- Communicating well to stakeholders what to expect from students' case work (NMBU, UCH) and involve them in planning and re-planning (UCH)
- Giving students regular feedback (AFSIHU)
- Hearing and responding to students' reflection and ideas (NMBU, according to students), but also balance which questions to address and which not (NMBU; according to a student)

"When answering questions during the reflection session, the teachers would never give us a proper answer. How surprising! Don't they have a key to share with us? Instead, we were openly sharing our understandings, our reflections, to come up with an answer that is shared, constructed altogether thanks to a mindmap. 'We need to encourage students to explore their own attitude toward the compelling issues of our time and then to move on to a next step of action' (Mendéz et al, 2016) is said in one of the course's books, and that implies a questioning phase that our teachers elicit in the classroom. It also resonates with Einstein's famous quotation: 'no issue can be solved with the same level of consciousness that created it'. I believe that not giving a unique answer or offering a unique path to comprehension is a way of inviting students to look 'inwards' and 'outwards' in order to find solutions. And as we are to deal with wicked problems such as solving sustainability issues within farming and food systems, we need to stimulate our creativity and look for innovative answers. Those answers can only be formulated with a whole new consciousness, that is aware of the wickedness of the situation. (student_446_reflection document_2021)" (NMBU_CDR_2022)

5.2.2 From students

From students, the change requires **the right attitude**. Six cases mentioned this in their case development report (NMBU, UNISG, AFSIHU, Skogforsk, SEKEM, UCH). Having the right attitude means

- embracing change, stepping out of comfort zone and try new tools, being adaptable. Being open minded and non-judgemental, ready to discover one's

own assumptions and knowledge gaps. (NMBU, UNISG, SEKEM, UCH, UoC, UoK)
- self-organizing and learning autonomously (NMBU, UNISG, UoK), and having clear learning goals (UoK)
- *"*"ERS (experience, reflection, sharing) activities were overwhelming and need better organization, this also requires a better balance between the students' free time and time for study. That could be achieved through the students' improved self organization' *(Teachers' reflection). This quotation demonstrates that a good self-organization is required from the students."* (UNISG_CDR 2022)
- courage: Daring to communicate, facilitate and interact (NMBU, UNISG)
- self-awareness, self-confidence, humility, and being OK with being wrong (NMBU)

Students needing enough time was mentioned by NMBU, AFSIHU, UCH and UNISG. Students need to get enough time, but also set aside enough time themselves. This last point can be further specified in that students need to balance study time with time off (UNISG) and need to take the time to learn from mistakes (UCH).

Additionally, students need to be **willing to work (a lot) in groups**, a point made by three cases (NMBU, UNISG, UoK), and need to be **good or active listeners**, i.e., they need to be good communicators and also facilitators (NMBU, USB). This point involves reciprocity in a non-hierarchical structure, both from teachers and students, as mentioned by students from NMBU.

5.2.3 From institutions

From institutions, the change requires **support** (UNISG, USB, AFSIHU, UoK, UoC), for example by **making the right infrastructure available** (NMBU, AFSIHU, UoK). The right infrastructure should, for example allow for a horse-shoe set-up in the classroom (NMBU).

Support can also take the form of

- financial support (UNISG, USB)
- more incentives for educational achievements (USB)
- A shared vision or change in mindset (AFSIHU, UoK)
- employing and adequate number of teachers (UoC)
- providing teacher-training in action-based learning techniques and sustainability issues (AFSIHU, UoK), or employ people with the right experience and train them (UNISG)
- giving departments managerial autonomy (UoK).

AFSIHU proposed dissemination of Nextfood results to engage others, as an institutional strategy to gain more support within the institutions.

5.3 Teachers´ perceptions of the greatest challenges to achieving a change to the Nextfood approach

Lack of time is according to the cases the greatest overall challenge, both during the course or educational activity and for development of a case. Lack of time was mentioned several times as a hindering force and was also named as one of the greatest challenges perceived by teachers.

Limited resources (AFSIHU, UNIOR, UoK) and **lack of support** (UNIOR, UNISG) are the greatest challenges related to **institutions**. Both challenges were already mentioned as hindering forces to the essential shifts and as something that needs to change to implement the approach. The following quotes specify the points made in more detail:

"Other challenge can be the lack of money to organize the practical activities – trips, lab analysis, competitions, etc. because most of the time they are invested in other directions. For this reason, the teachers need to find funds by themselves due to the co-operation with the partner companies, which means extra time and extra effort from their part." (UNIOR_CDR_2022)

"Lack of sufficient institutional support was considered as the greatest challenge to achieving such change. This institutional support includes economic support (provided funding for people involved in action learning activities) and organisational issues (including favourable conditions for continuous application of action learning approach)." (UNISG_CDR_2022)

Lack of training is a major challenge related to **teachers and facilitators** (AFSIHU, UoC, UoK, USB). Training requires time, and another challenge mentioned is **time management**, more specifically limited availability of time due to other professional requirements (NMBU, AFSIHU),

"The challenges that we faced point towards the need for more time investment to engage professors in reflection and perhaps even challenging their role as instructors supporting a facilitation mindset. Flexibility and adaptation are key to this and any transition needs to be supported actively throughout the process involving all participating actors. It is also crucial to find and cultivate common motivators that will ensure all participants' engagement." (AFSIHU_CDR_2022)

or the extra time required to deal with the extra practicalities that manifest themselves to the ones implementing the approach (UNIOR). A third and related challenge is **the heavy workload** if a course based on the Nextfood approach runs at the same time as other courses (UoK, USB). UoK described challenges in more detail as follows:

"Teachers have raised challenges related to both functional and structural aspects. When it comes to functional aspect, running the course along with conventional courses at the University, creates a double burden on teachers as on the one hand, they have to lecture in conventional courses, and have to prepare more intensely to act as facilitator in action learning course, since it is offered as a add on certificate course. Both conventional courses and action learning course demand largely different attitude, skills set/competence and timing. This duality effects the quality of classes and teachers are faced with hectic work schedule. This creates issues in scheduling course activities, conducting continuous assessment and even in ensuring availability of classrooms. If the intended shift, (that the teachers were able to initiate) has to sustain, teachers need support from institutional authorities and other stakeholders. A change in attitude, flexibility in responsibility sharing, freedom to take functional decisions should be ensured for teachers. Here, ensuring additional infrastructure and resources, training new/

junior staff, expanding already established acceptance of the approach, networking is very important." (UoK_CDR_2022)

Good planning is key to partially overcome this challenge (CIHEAM, Skogforsk), including having a plan B ready (Skogforsk, UoK), and *"organizational issues should be improved"* (UNISG).

Challenges related to **students** were mentioned by only a few cases and from the cases who did, only two challenges were mentioned by two cases each:

- **Clear communication and definition of expectations** (NMBU, Skogforsk)

"Most of the learners in our case, i.e., forest owners at different ages and experiences are used to traditional learning situations, where they are the receivers of knowledge or instructions. Therefore, it is important to know what their expectations are on beforehand, and for us to explain the concept of centric learning – what it means and what it means to be a part of this – and to be clear about what we are expecting from them.

'I think we could have been clearer about the goal and the aims from the start. We offer three things in the course description: centric learning, biodiversity, and the core competences. But it was not as obvious for the participants as it was for us, I am afraid.' *(Member of the Skogforsk team)"* (Skogforsk_CDR_2022)

- **Diversity in the student group** (NMBU, UoC)

"Students often also have very different expectations, motivations and understanding, and handling this can at times be quite difficult for the teachers. The action learning approach requires high involvement from the students, and therefore dissatisfaction can easily affect the learning environment.

'The difference between our programme and others is that if students are not satisfied with the course/approach, it affects the learning environment a lot in our programme.' *Teacher reflection_S13_2021."* (NMBU_CDR_2022)

Challenges related to **stakeholders** were mentioned by only four cases and they all mentioned different challenges, for example

- **Involvement** (CIHEAM)

"The involvement of stakeholders has been challenging, more dictated by good relationships with teachers and/or on services provision mechanisms (paying fees to actors for their interventions) rather than by a real concern on activities and action learning results. (COACH5END_2021)

It is always a matter of concern thinking of the benefits stakeholders can draw from interacting with our course modules and to engage them in a continuous and fruitful exchange." (CIHEAM_CDR_2022)

- **Many uncertainties**, even risks (NMBU)

"Sending out students to externals whom teachers are unfamiliar with also comes with a certain risk. In relation to this, teachers stated that it is important for students to have sufficient time to prepare the casework, which again connects to the challenge of time management.

'Another thing: When students go to the farmers, they also interact with farmers who maybe are not ready to interact with such a group. This came about with a farmer who is in a difficult situation. We also take a risk there. We don't know the farmers well enough and we send a

group of students to them which ask very critical questions and want them to envision the future.' *Teacher reflection_S08_2021"* (NMBU_CDR_2022)

- **Community matching** (UNISG)

"As was mentioned before, MAFS has case-based approach and the 3rd experiential phase was a central part of the program that allowed to the students to carry out their research and to connect theory and practice. Therefore, processes of community selection and matching the students and communities were very important as for the students as for the stakeholders (representatives of the communities). However, a great challenge was related to the organizational issues of the of community matching." (UNISG_CDR_2022)

- **Motivation and lack of communication skills** (USB)

"During the course, the motivation of the students is challenge in conditions of the Czech Republic (and probably in most of the eastern Europe countries). Specially to support their communication skills is in some cases long process. Another challenge is coordination of all actors and keeping of the course structure." (USB_CDR_2022)

5.4 Reflections towards the end of the project on the two overarching shifts

As mentioned in the Introduction section, the six essential shifts reported on above sum up to two overarching shifts characterising the Nextfood educational approach:

- From theory to phenomenon (experience) as the starting point for the learning process.
- From transmission of knowledge to the development of key competences as the educational goal

The results below present the cross-case analysis of the cases' reporting on these two overarching shifts.

5.4.1 What has been accomplished to shift from theory to phenomenon (experience) in agrifood- and forestry systems as the starting point for the learning process?

Shifting from theory to phenomenon as starting point for the learning process was possible by providing the students with real-life cases to involve in and train the competences as emphasized by seven cases (CIHEAM, UoK, NMBU, UNISG, AFS, UCH, and Skogforsk). CIHEAM made progress towards this shift by making action learning the centre of the educational program. Rather than moving away from theory, they started to see theory as complementary and a support to analysing and learning from phenomena. They used a multi-stakeholder approach where students interacted with topic experts and stakeholders from the field. UoK highlighted the use of various activities to train the competences, and how factors such as a limited number of students enabled learning from phenomenon. Participation in the Nextfood project was also mentioned as important for the progress in this shift, through the cyclical and iterative process of learning and research. NMBU noted how reflection was a competence that supported the students in learning from experience and as such was an important competence for making this shift. Moreover, students were encouraged

to use theory as a supplement to learning from experience, as when being provided with lectures and readings 'just in time' to deal with issues that came up in their real-life casework.

UNISG introduced study trips for bachelor students that included experience and reflection to connect theory and practice. The action learning approach was adapted to an online learning environment. Moreover, they planned and implemented a master program where experiential learning and research in communities was established at the center of the learning process. For AFS, participating in the Nextfood project enabled progress towards this shift to various degree depending on the size and nature of the student group with which they introduced action learning activities. In larger groups of students, they introduced activities where students could meet with professionals in their field of study and discuss real-life issues, and they introduced new educational activities that required personal involvements from students. In the final Nextfood year, AFS implemented an Action Learning Set (ALS) methodology to introduce action learning to a small number of students, teachers, advisors, and farmers. These sets allowed for a multi-actor approach, where the students involved in real-life issues and how to deal with them in collaboration with the other participants in the learning sets.

UCH emphasized the use of innovative and diverse content for classes to prepare the students for field visits. The progress towards the shift was made by having the students involved in real-life cases and making suggestions for change. Skogforsk mentioned that focusing on co- and peer learning was important for this shift. Using real-life situations as learning arenas and relating theory to experience allowed the learner group to practice core competences and learning from phenomena. Moreover, communication in the learner group between meetings was highlighted under this shift.

For ISEKI, the shift to phenomenon as starting point for learning was adapted to their online format, taking departure in the students' experiences and needs for knowledge to learn more about a situation or topic. Training the learners to involve in the learning process helped moving towards this shift. SEKEM highlighted how good preparation and planning enabled them to provide students with real-life case studies. They started with a smaller group and gradually increased the size, to ease the control and facilitation of the shift. UNIOR expressed how the multi-actor approach and gaining knowledge and experience about action learning through discussions and reflections enabled this shift. UoC developed a course framework and network to enable action-reflection based learning. USB approached the shift by making course content more practice-oriented and focusing on linking theory to practice. The students involved in communication with external experts.

5.4.2 What has been accomplished to shift from transmission of knowledge to the development of key competences needed to support sustainable development in agrifood and forestry systems?

To shift from transmission of knowledge to the development of key competences for sustainable development, the cases designed, adapted, and implemented activities to train the competences. AFS used action-based activities to address the key competences. They encouraged university teachers to work on the competences and introduce them to students in existing courses. Introducing the questionnaire of

competence development helped students to reflect on their competence development. Moreover, skills and competences were implemented in the vocabulary in the communication between participants involved.

UoK took departure in participatory experience and co-creation of knowledge with stakeholders to deal with real-life challenges. The practice of core competences was enabled by introducing a diversity of learning activities to the students. Teachers and facilitators made progress in becoming facilitators, allowing them to support students in the development of competences. Moreover, the establishment of an educational centre enabled UoK to work around the institutional barriers to implement action learning. Farmers took part in the learning process as facilitators during students' field visits. NMBU had already worked on implementing this shift for many years, however, during the Nextfood project, slight changes were made to further improve competence development among students, such as using course alumni as mentors and facilitators in the course. In general, competence development was enabled by practicing the competences in farming and food systems' inquiries and in class sessions.

ISEKI emphasized how practicing core competences with students through concrete exercises enabled this shift. CIHEAM reviewed their didactical approaches and encouraged teachers to place students at the center of the learning process. They designed activities for students to engage more in the learning process. UNISG included key competences in study trips for bachelor students and implemented group exercises to practice the competences. Good course organization of the one-week course for master students allowed students to improve key competences. They included numerous activities for this shift in the new master's course, introducing action learning and core competences from the beginning. Weekly reflection sessions and individual reflective journaling were included.

Skogforsk pursued this shift by practicing core competences with the learners from the beginning of the course. They encouraged the learners to write a reflective journal and included exercises to practice core competences. UCH used exercises from the Nextfood Toolbox to introduce and practice the core competences. They made the students aware of the shift to development of key competences from the beginning and thought of this shift when planning each class. In each class they worked on one or more of the key competences, using exercises to base understanding on experience. Reflection exercises were used during the whole course.

SEKEM highlighted the need to properly introduce the NextFood approach to instructors and mentors, and the need for them to become facilitators. Moreover, designing a schedule that allowed to train the core competences, being in the field, creating a shift in mindset to appreciate reflection, and increase enthusiasm towards the action learning approach. UNIOR exposed students to the new learning approach to enable improvement of key competences and working with stakeholders.

USB linked the development of key competences among students to problem-solution during real-life cases (on farms) and the communication with external experts. Communication with experts motivated the students to improve skills and competences. Linking theory in the course to practice in real-life case was mentioned as important. To make progress towards this shift, UoC put a skill and competence-based curriculum in place.

What are the prerequisites for making a successful shift from theory to phenomenon (experience) as the starting point for the learning process?

Institutions

The findings indicate that action learning need to be recognized on an institutional level, as highlighted by nine cases (AFS, CIHEAM, UNISG, NMBU, ISEKI, SEKEM, UoC, UoK, USB). This general prerequisite could more concretely include the provision of economic, logistic, and physical resources to enable action learning (arenas, tools, etc) (AFS, CIHEAM, UNISG, ISEKI, SEKEM). Moreover, the institution could allocate time and economic resources for professors to develop and engage in action learning (AFS, CIHEAM, UNISG, ISEKI, UoC). Extra-institutional collaboration appeared as important, including to identify relevant stakeholders in agrifood systems and creating synergies with them (AFS, CIHEAM, UoK, USB). Moreover, that the institution and/or department develop an understanding of the current educational system and envision action-based learning for sustainable development at institutional/departmental level was mentioend as a prerequisite (NMBU, AFS, UoK). AFS mentioned continuous evaluation of curricula and inclusion of sustainability curricula, inclusion of courses in management and communication, and enhanced communication between departments as prerequisites for institutions. CIHEAM notes as important the identification of ways to build trusts between learners and stakeholders as well as learners and learning facilitators and addressing the mental attitude to shift to and the motivation for action learning. Furthermore, clarifying the link between the sustainability concept and the connection with systems thinking and practice, and develop more holistic assessment methods (CIHEAM).

Teachers

Most cases pointed to the prerequisites for action learning on the part of teachers. There was some overlap between mentioned prerequisites for institutions and teachers.

Developing as learning facilitators

Identifying teachers who are ready to become learning facilitators and improving teaching skills to enable action learning was important, as highlighted by six cases (UNIOR, AFS, UNISG, ISEKI, SEKEM, NMBU). ISEKI mentioned the need for teachers to let go of control and clarify roles, while Skogforsk mentioned it was important to demonstrate curiosity. Besides, teachers would need to enhance their personal knowledge on sustainability issues and take steps to include it in their courses (AFS). Team- and groupwork among teachers was mentioned as a prerequisite, and building a team who believe in experiential learning pedagogy (UNISG, UoK, UoC). This would imply the training and development of facilitation skills (UNISG, UoC). UoK mentioned how acquiring managerial autonomy could be important, since action learning requires immediate and innovative decisions. Other prerequisites for teachers mentioned were proper planning of field visits, and planning for flexibility (USB, SEKEM), finding and using different learning arenas (Skogforsk), evaluating and updating course syllabi (AFS), emphasize competence development and soft skills interventions during course implementation (AFS), determine participants' background before a course (SEKEM), and the possibility to have intercultural communication (SEKEM).

Teachers' communication with students

To build and facilitate a learner-centred and safe learning environment with the students was mentioned as a prerequisite, making sure that they feel comfortable to share experiences, opinions with facilitators and other students, enabling co-creation of knowledge (ISEKI, UoC, AFS). Linked to this, it could be useful to collect students' feedback, identify their needs, and allocate sufficient time for student support (AFS).

Enhancing student motivation and engagement also came forth as important (AFS, UCH), and demonstrate to students that they have the tools to make the shift towards sustainable systems (UCH), indicating that teachers should facilitate empowerment of the students. Moreover, keeping the approach "simple" by being clear about topics and boundaries and using an easy language, and clarifying learning goals (Skogforsk, UNISG), were mentioned as prerequisites to get the learners on board.

Students

One prerequisite was to have motivated students (UNIOR), and another to establish students' academic commitment (AFS). Moreover, students should be ready to step out of their comfort zone to take part in the unconventional learning activities (AFS). Groupwork of students was another prerequisite (UNISG). The diversity among students and the need for strategies to deal with it should be recognized, and moreover, one should focus on the facilitation of group dynamics in student groups and action learning (NMBU).

Other stakeholders

A good network of stakeholders came through as important, including to maintain trustworthy and reciprocal relationships with stakeholders and working with a transdisciplinary teaching staff (UNISG, NMBU, UCH, AFS). UNIOR mentioned the need to involve stakeholders in all stages of a course and finding their motivation to participate. Moreover, they emphasized the need to have a diversity of partners and having an experienced partner for support along the way as prerequisites. AFS highlighted how stakeholders should be ready to engage with students, open to collaborate with academia and extended networks, and open to make changes for sustainable development.

5.4.3 What is your concrete advice on the shift from simple knowledge transmission to the development of key competences?

Based on their experiences throughout Nextfood, cases gave their concrete advice on how to succeed making the shift from knowledge transmission to the development of key competences. Eight cases gave the general advice to put focus on the development of all core competences (AFS, ISEKI, UCH, UNIOR, USB, UNISG, UoK, NMBU). This entail enabling teachers, students, and stakeholders to practice and develop sustainability competences. More concretely, it was mentioned one should use case-based learning and group work to develop competences and explain competences clearly to students and stakeholders from the beginning, making them as concrete as possible. Students should train competences in small groups, and teachers should encourage students to keep a reflection log and consider introducing

a reflection document as a key assignment. Putting emphasis on reflection was in general considered important, and it was mentioned it should be concretized by setting aside time for reflection in the schedule, both for students and facilitators.

The cases' advice for facilitating action learning, as related to the development of key competences, was to organize the course as a learning cycle with a real-life case at the centre (NMBU) and to make sure to build a safe learning environment (Skogforsk, UCH). Moreover, to balance knowledge and theory with exercises and practice (CIHEAM, USB), use systems thinking to understand complexity (CIHEAM, UCH), diversify student assessment (AFS), and encourage autonomous learning by encouraging students to take responsibility for their own learning (UCH, USB).

Advice regarding teachers' development to enable this shift was to value and train the teachers as facilitators (CIHEAM, SEKEM, UoC), which could be linked to creating a team ready for action learning and research (UNIOR). Moreover, the teachers should also practice the core competences, and reflection in particular (NMBU). Regarding mindset, UoC mentioned one should accept knowledge as fluid and not static, and UoK adviced to trigger attitudinal shifts for action learning. Moreover, it was highlighted that the teacher team should include field visits and allow for interaction with multiple stakeholders (AFS, CIHEAM), that one should seek multicultural interaction amongst students and facilitators (SEKEM), keep a focus on developing higher order thinking skills amongst students (UoC), use a variety of learning arenas, tools, methods (USB), and encourage inter-institutional and international cooperation amongst students (USB).

Otherwise, in developing a course or educational program with regards to this shift, it was mentioned that one should use already existing knowledge about action learning (SEKEM, UCH) and include a cyclical and inclusive development of the case, by planning, implementation, and reflection (NMBU), together with involved stakeholders (UNIOR). Moreover, UoK mentioned one should develop infrastructure for action learning (learning arenas, resources, tools) and mobilize resources for action learning. AFS adviced to disseminate results from NextFood and other action learning research projects to promote action learning, which could help to increase support for implementing the approach.

5.4.4 Main challenges and how to deal with them

Almost all cases defined main challenges that in one way or the other could be related to communication and motivation for action learning (AFS, CIHEAM, ISEKI, Skogforsk, UCH, UNIOR, UNISG, UoC, USB, SEKEM). Some of the challenges were directed towards specific actors, such as either teachers or students, while others were more general and directed to all actors involved. CIHEAM's challenge was how to integrate extra-institutional actors in educational activities, while UCH wondered how to implement the approach in other courses. ISEKI focused on the motivation of stakeholders and their acceptance of competence training. Two cases focused on how to make students understand and value the approach (SEKEM, Skogforsk), while another was directed towards motivation of teachers (AFS). In one case the challenge was directed towards changing mindsets to open up for the approach (UoC), while

another focused on ensuring long-term motivation (USB). While the challenges were formulated in different ways, one could say that the essence of them altogether was *how to spread action learning*, i.e. how to get more people involved in such an approach to education. UoK defined challenges that were more concrete on how to train new action learning staff, how to provide benefit for farmers involved, and how to gain managerial autonomy. At NMBU, the main challenge was how to create a balance between action/experience and theory/reflection, and between the focus on content and process. In essence, the challenge was how to balance the interaction between experience and theory.

The ideas to overcome these challenges pertained mainly to communication (including dissemination), involvement of relevant actors, and building a competent network of action learning teaching practitioners. Ideas on communication at the institutional and teacher level included to communicate and disseminate results from research on the implementation of action learning (ISEKI, UNISG, UoC, USB), increase the level of communication with potential partners in action learning (CIHEAM, UNISG, USB), explaining action learning theory to academics (UoC), and convince institutions of the usefulness of the approach (UNIOR). Ideas on communication regarding the students was to communicate clearly about the approach, address the of translating observations into theory, have regular interactive sessions and reflection sessions to build shared understanding of the approach and each other, and provide experiences that demonstrate the benefits of the approach (NMBU, Skogforsk, SEKEM, UCH).

Ideas on involvement included to find stakeholders who would commit to long-term participation in a course (ISEKI), and to formalize an extended learning group where stakeholders could get a course diploma for their participation (CIHEAM). More specifically regarding the students, ideas included to have students as facilitators and teaching assistants (UoC, UoK). Ideas on building a competent network included creating national and international networks of teaching practitioners engaged in action learning (AFS, UNIOR), providing teacher training to build competences (AFS), building teams with complimentary capabilities (UoC), and to formalize a network for planning, implementation, and reflection of educational activities (CIHEAM). Another idea was to make the degree of action-based learning an integrated part of teacher assessment, or course accreditation (UoK, AFS). Having a network of action learning practitioners and related actors came through as important for maintaining motivation and drive for the approach (UNIOR).

6 Concluding remarks on the case development

6.1 On the case development since the previous reporting

In this section case leaders share what they perceive to be 'the essence' of the last cycle in their case, based on the primary data and analysis they presented in their respective case development reports. This section thus serves as a conclusion to what the results (reported on in the previous chapter) might mean for the cases moving forward.

6.1.1 The most useful and inspiring experiences (supporting forces)

Enthusiasm is without a doubt the most inspiring experience and can be best illustrated with quotes from the case development reports.

- **Enthusiasm amongst students**

"The most inspiring experiences for the students were those in which they interacted with the stakeholders. Someone that can inspire students and someone that can turn the session into something different, like in the case of the farmer during field visits or the session 4, in which students expressed and experienced gratitude, emotion, inspiration, and motivation 'Students are expressing a need of inspiration because they are disappointed of the current system in which they are developing as professionals' (Teacher 6_reflection document_2021). They were inspired by the farmer's ability to deliver their knowledge, without filter, the best disposition to teach from humility. They were inspired because through the case studies they realized that agroecology is possible but it is difficult. On the other hand, students realized about the obstacles that you can face in the field. In that sense, this relationship was also useful for them to open their eyes and face reality." (UCH_CDR_2022)

"It was very inspiring to see happiness of students when they got in direct contact with the actors." (CIHEAM_CDR_2022)

"Feedback session (FGD) with students was inspiring, as students shared their experience of learning process, in which they explained how each educational activities helped to develop particular competences, and to what extent they found the new approach to learning useful and inspiring." (UoK_CDR_2022)

"[I]t was very inspiring to see the students inspired and grateful during sessions and field visits. A very strong bond was generated between the students and the teaching team, receiving and giving positive feedback from and for the students, is an extra motivation to the teachers to continue with this path." (UCH_CDR_2022)

- **Enthusiasm amongst teachers and facilitators**

"In this cycle it was so easy for me to identify activities that I considered appropriate to develop the participation competence of the students. I felt as if something has changed, maybe it was my perspective or even the mind-set. (TRD_T13_2020)" (UNIOR_CDR_2022)

"By far the most inspiring element of the ALS activities was the participants' perception of them as a supportive setting with a positive atmosphere that promotes good communication. So, the willingness of participants to engage the rich products of this engagement were strong motivating factors for continuing the transition to action-based and multi-actor learning

environments. As seen above, this was documented both by students and professors in their reflection logs and is also evident in the ALS observation logs." (AFSIHU_CDR_2022)

"You must have motivated teachers in your teaching team, because is a time consuming task, that requires creativity and motivation towards change 'More than agroecology, the topic of new teaching methodologies motivates me in this course, new ways of learning and teaching. I am interested in being able to offer more motivating courses, because sitting in front of a computer with a person talking and the rest in silence, it is very similar to what was done in the 1950s. New technologies have taken this (education) back in time because teachers have not been able to adapt, so the idea is to start adapting' *(Teacher 1_notes from session 1_2021)."* (UCH_CDR_2022)

- **Enthusiasm amongst stakeholders**

"It is also important to count with the support and engagement of the stakeholders that participated in the field visits. Without that interaction, the outcomes of the course would be very different. Working with stakeholders, give dynamism to the learning experience, and it can lead you to earn 'unexpected learning outcomes'. Neither the students nor the teachers have total control of the situations that are occurring, and that is positive because is experiential learning for every participant." (UCH_CDR_2022)

6.1.2 Main obstacles/challenges encountered (hindering forces)

- Restrictions due to the Covid-19 **pandemic** were still a major obstacle for several cases in the last cycle.
- **Limited time and resources**.
- **Weak participation** of students. This could be overcome by good facilitation, which engages students and thus makes them participate actively. But good facilitation requires that **teachers should become facilitators**, a process that takes time and therefore is a main obstacle in itself.

"When speaking about facilitators, the newcomers felt the same difficulty in giving up on the control and old practice and two questions naturally emerged: 'how to teach other teachers'- passing/transferring the existent information from the Nextfood project and adding new methods and tools and 'how to become a facilitator?'." (UNIOR_CDR_2022)

- **Balancing** students' workload, between studying and free time, but also between theoretical classes and experiential parts, and between letting them experience difficulties and guiding them in their learning process.

"Besides aforementioned institutional hindering forces, there are several other challenges. Firstly, a right balance between course content (theoretical classes) and experiential part (farm visits). Both these activities are very rich and provide a lot of information to the students, that is why including them in 1 week causes time pressure for the students, as some of them need more time for understanding the course content." (UNISG_CDR_2022)

- **Perception of stakeholders** that they have nothing to gain from participating, and therefore take on the role of teacher rather than facilitator or co-learner.
- **Adapting** the approach **to other types of learners** than university students, was a challenge for Skogforsk and UNIOR.

6.1.3 Lessons learned from the inspiring experiences and from dealing with the challenges

- Good **planning** is key (CIHEAM, Skogforsk), including a plan B (Skogforsk, UoK), and *"organizational issues should be improved"* (UNISG)
- **Training teachers in facilitation** is a necessity and takes time
- The **core competences** and related tools provided by Nextfood are key but need to be defined and explained.

"And in order to promote the development of the key core competences, the teaching team should focus in strengthen the leadership and autonomy of the students (that is, make the students face the problems, propose ideas, compare and share them among themselves and with academics and farmers, then synthesize the proposals/solutions), 'we should keep in mind that the central focus is the "why" and "what for" of a complex problem, and then comes the "how", that is, the goal is to learn and understand a system, then how the problem can be faced. trouble. In my opinion, the simple transmission of knowledge focuses on the how and leaves aside the foundation of understanding the system' *(Teacher 5_notes on reflection meeting_2021)"* (UCH_CDR_2022)

- Indeed, **clarity** in expectations and instructions to students are a must
- This is part of **continuous communication** among all actors, which is also a must
- To include a **multi-stakeholder approach**, one should invite experts and industry representatives, or professionals, farmers, and representatives from the public sector, interdisciplinary teaching teams (i.e., more stakeholders and from more diverse backgrounds) improved students' motivation and learning. Moreover, one should have permanent contact with stakeholders, improve collaboration between stakeholders and university, and identify the added value for all involved stakeholders.

6.1.4 Plans for how to move forward into the next cycle

- **Disseminate results** (AFSIHU) to **convince others** to also implement the approach through a series of relevant seminars (CIHEAM) or sharing of experiences with colleagues that might be interested (UCH)
- Improve further on implementing a **multi-stakeholder approach** by organizing various intermediate meetings with stakeholders (CIHEAM), or by collaborating more closely with stakeholders to improve their participation and make it more useful and interesting for the students (UNISG).

Looking beyond the next cycle, AFSIHU stated that the Nextfood project has given the insights into what needs to be done to transition to education for sustainable development

"The Nextfood transition experience has given us valuable insights into the factors that need to be taken into account, on a personal and institutional level, in order to provide effective education supporting sustainable development. It has given us insights into the hierarchy of needs that need to be covered, the attitudes and mindsets that need to be challenged and adapted and the active involvement and networking that need to take place." (AFSIHU_CDR_2022)

But given the challenges and hindering forces that need to be dealt with, not all cases foresee that they can continue implementing a full-fletched Nextfood approach.

- UoK and NMBU plan to continue their courses and develop them further

"Centre for Agroecology and Public Health is determined to continue with the course, as it received recognition from university and there is demand from students to join the course. The course hopes to make use of the Nextfood tool box for technical support. Other plans include, offering the course in online mode and offering the course as a credit course to affiliated colleges so that graduate students can participate." (UoK_CDR_2022)

- USB wants to slightly improve structure and content of the courses and UNISG plans improvement of didactic activities.
- At the time of writing the case development report, Skogforsk did not plan a new cycle of the course.
- At UCH, it was under consideration if the course would be implemented as such again.
- SEKEM planned strong collaboration between this project and other educational projects, and also other cases mentioned the need for further support in order to continue:
    - *"There are future plans to continue this course if partnership agreements could be achieved with other Universities or funding bodies."* (UoC_CDR_2022)
    - *"Planned is also further cooperation with institutions from other countries focused on similar topics, in form of the joint on-line meetings and workshop (as motivation of the students for the communication and valuable experience)."* (USB_CDR_2022)

6.2 Suggestions for further research

Developing educational programmes in line with the Nextfood approach is a comprehensive and complex task, as demonstrated by the findings presented above. As shown by the cases' different takes on and experiences with action learning, the approach needed to be adapted to each specific case and context. Implementing the action learning approach through action research also implied remaining open to continuously improving the educational programmes. It appears that the Nextfood approach and similar approaches could be used as guidelines to implement action learning but should still give actors space for alternative takes on the approach. While it appeared that having students involve in real-life casework allowed them to practice and develop sustainability competences, it was in some cases difficult for the learners to understand and distinguish the core competences trained, from other skills or everyday activities. Besides, a major challenge faced by teachers when making the shifts towards the Nextfood approach was the lack of time, as it implied becoming facilitators and spending more time on educational activities and case development. Moreover, the involvement of stakeholders was both a major challenge and source of support and inspiration.

Our findings suggest that further research should be done on how to adapt the Nextfood approach or similar approaches to a diversity of cases. More research is also needed on how to facilitate the development of sustainability competences for a diversity of students. Moreover, further research should investigate how educational

institutions can facilitate the implementation of action learning in their educational programmes. Finally, research should be done on what it would take to implement the Nextfood approach at a whole-institution level.

More specifically, the following are interesting, emerging research questions to be addressed in further research:

- How can the action learning approach be adapted to different types of learners?
- What are prerequisites for becoming a facilitator of learning – and how can these be met?
- How can stakeholders contribute to and benefit from their involvement in action-oriented education?
- How can the action learning approach be implemented at a whole-institution level?

7 References

Armson R (2011) Growing wings on the way: systems thinking for messy situations. Triarchy Press, Devon, UK

Batie, S. S. (2008). “Sustainability science: statement of the Friibergh Workshop on Sustainability Science.” American Journal of Agricultural Economics 90(5), 1176-1191.

Bernard, H. R. (2006) “Research methods in anthropology – Qualitative and quantitative approaches.” (4th edition) AltaMira Press, A Division of Rowman & Littlefield Publishers, Inc. Lanham, New York, Toronto, Oxford.

Nextfood deliverables

D2.1 “Action research protocol (M14)”: Lenaerts, L., et al. (2019) “D.2.1 – Action research protocol” NEXTFOOD: Educating the next generation of professionals in the agrifood system. EU Horizon 2020 research and innovation programme under grant agreement number 771738. URL: https://www.nextfood-project.eu/deliverables/

D2.8 “Annual case development reports (year 4, M48)”: Brudevoll, K. et al. (forthcoming) “D2.8 – Annual case development report, year 4” NEXTFOOD: Educating the next generation of professionals in the agrifood system. EU Horizon 2020 research and innovation programme under grant agreement number 771738. URL: https://www.nextfood-project.eu/deliverables/

D3.1 “Review report of educational approaches (M14)”: Lieblein, G. H. et al. (2019) “D3.1 - Review report of educational approaches” NEXTFOOD: Educating the next generation of professionals in the agrifood system. EU Horizon 2020 research and innovation programme under grant agreement number 771738. URL: https://www.nextfood-project.eu/deliverables/

D3.5 “Report on educational strategy (year 3, M36)”: Bogstad, M. H. et al. (2021) “D3.5. – Report on educational strategy, year 3” NEXTFOOD: Educating the next generation of professionals in the agrifood system. EU Horizon 2020 research and innovation programme under grant agreement number 771738. URL: https://www.nextfood-project.eu/deliverables/

Dewey, J. (1916) Democracy and Education. New York: Macmillan.

Frisk, E. and K. L. Larson (2011). "Educating for sustainability: competencies & practices for transformative action." Journal of Sustainability Education (2March 2011).

Hjortso, C. N., et al. (2005). "Rapid stakeholder and conflict assessment for natural resource management using cognitive mapping: The case of Damdoi Forest Enterprise, Vietnam." Agriculture and Human Values 22(2): 149-167.

Levin, M. and J. E. Ravn (2007). "Involved in praxis and analytical at a distance." Systemic Practice and Action Research 20(1): 1-13

McGill, I. and Beaty, L. (2001) Action Learning. London: Kogan Page.

Mezirow, J. (ed.) (2000) Learning as Transformation: Critical Perspectives on a Theory in Progress. San Francisco, CA: Jossey-Bass

Mezirow, J. (2003) “Transformative learning as a discourse.” Journal of Transformative Education 1(1): 58-63

QSR International (2020). NVIVO Qualitative Data Analysis Software.

Revans, R. (1998) ABC of Action Learning. London: Lemos and Crane.

Schmidt-Bleek F, Wilenius M, Lehmann H (2014) "The challenge of the whole. Creating system policies to tackle sustainability". In: Angrick M, Burger A and Lehmann H (eds) Factor X. Policy strategies and instruments for a sustainable resource use. Springer, Dordrecht

UNESCO (2017). "Education for sustainable development goals: learning objectives. URL: https://unesdoc.unesco.org/ark:/48223/pf0000247444

Weitz, N., Carlsen, H., Nilsson, M., and Skanberg, K. (2018). Towards systemic and contextual priority setting for implementing the 2030 Agenda. Sustainability Science **13**: 531-548.