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ASKFOOD – Alliance for Skills and Knowledge to Widen Food Sector-related Open Innovation, Optimization and Development

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Deliverable D3.1

Step-by-step guide to training activities to be developed

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Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including Commission services and projects reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and projects reviewers)	**X**

Summary:

This deliverable is a step-by-step guide for teachers and facilitators for developing and implementing training activities that will support the evaluation of existing courses at each partner's level. The guide will contain a teacher's guide, facilitators' guide, teaching tools, methods and materials, as well as a list of selected activities with target groups, learning outcomes, methods and implementation plan to serve as the common basis for the ASKFOOD Joint Training Course and Common Training Catalogue.

Content

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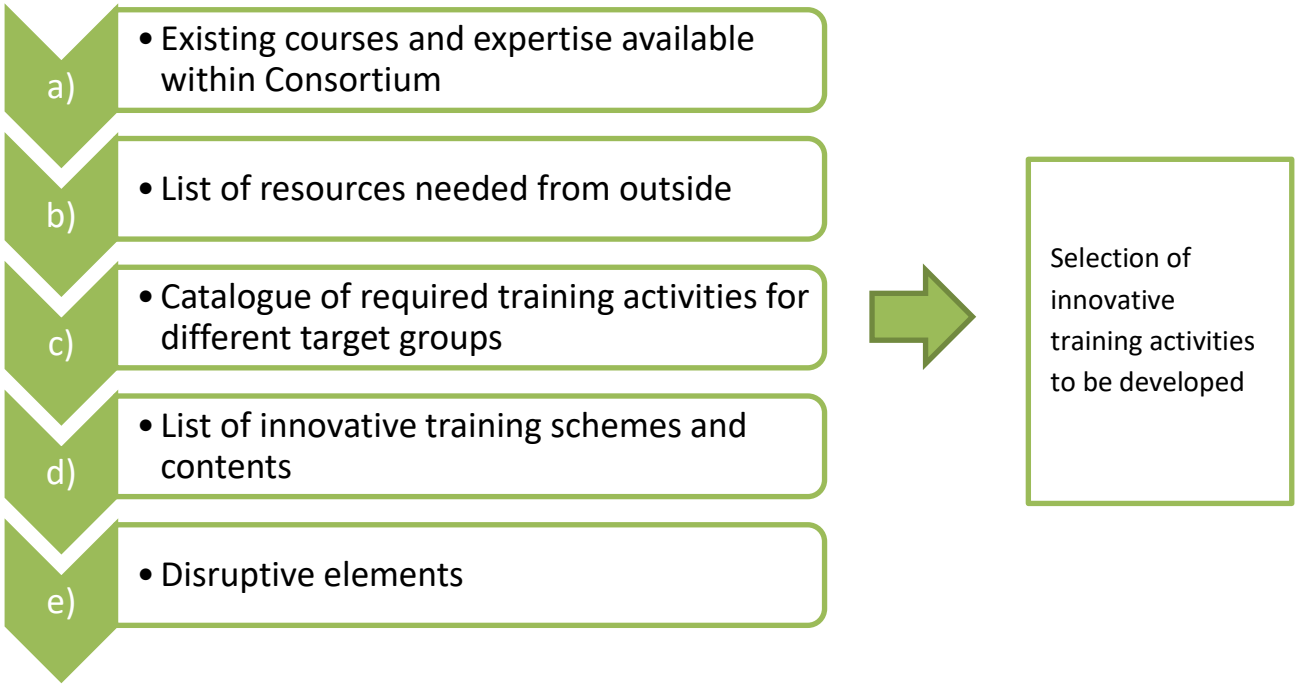
1 Introduction

The overall aim of task 3.1 is to innovate existing training schemes for different target groups (students, teachers, professionals) through the mapping of the following 5 elements:

a) List of existing courses and expertise available within the Consortium
b) List of resources needed from outside (by matching the list of existing courses and expertise available within the Consortium (a) with the list of innovative training schemes and contents (d). Having identified the resources/expertise needed from outside, online trainings will be carried out (e.g. on soft skills training) (from April to June 2019) both as physical workshops and as online trainings to partners.
c) Catalogue of required training activities for different target groups
d) List of Innovative training schemes and contents at academic, CPD and industry level (this corresponds to the outcome of the questionnaire)
e) Disruptive elements that can be inserted to renovate the training offer according to the 5 Ps model.

Based on the mapping of these five elements, training activities to be developed will be selected (task 3.1) and based on this innovative training schemes in CPD and Joint Master Degree Programmes will be designed and developed (task 3.3).



This deliverable D3.1 summarises the mapping exercise through the development of a step-by-step guide for teachers and facilitators for developing and implementing training activities that will support the evaluation of existing courses at each partner's level. The guide will contain a teacher's guide, facilitators' guide, teaching tools, methods and materials, as well as a list of selected activities with target groups, learning outcomes, methods and implementation plan to serve as the common basis for the ASKFOOD Joint Training Course and Common Training Catalogue.

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2 Teachers' and facilitators' Step-by-Step Guide for Developing and Implementing Innovative Training Activities

The main objective of ASKFOOD WP3 is to innovate existing training schemes for different target groups (students, teachers, managers, professionals, start-up entrepreneurs, and innovation brokers) so as to complete a portfolio of disruptive training contents, methods and tools with the help of a "step-by-step guide" to (de) activate training solutions. With rapid technology advancements and job markets ever changing and becoming more competitive, so is the need for innovation in learning and teaching.

This Step-by-Step Guide is based on the outcomes and lessons learned in the survey carried out during the autumn of 2018 on "Innovative training tools and creative teaching techniques" among 77 teachers (from 22 different nationalities) and trainers working in HE institutions, professional training organisations, VET and professional organisations worldwide.

Data from the online questionnaire ***ASKFOOD - Questionnaire on innovative training tools and creative techniques*** (hereinafter referred to as the "ASKFOOD Questionnaire") available at https://www.askfood.eu/node/148/webform-results/download was collected in the period from 25.09.2018 to 06.12.2018.

The raw but processed data from the questionnaire can be found in Annex 1-8.

For the purpose of developing a guide for developing and implementing innovative training activities that can also be used in practice by teachers and facilitators, the guide is structured and built on the commonly used ADDIE model – an instructional design model – developed in the 1970s as a means for instructional designers and training developers to help organise and streamline the production of course content. Since then, practitioners have made several adaptations to the model making it more interactive and dynamic, however, still with the influence of the original ADDIE method. ADDIE is an acronym for the five stages of the course or programme development process: Analysis, Design, Development, Implementation, and Evaluation:

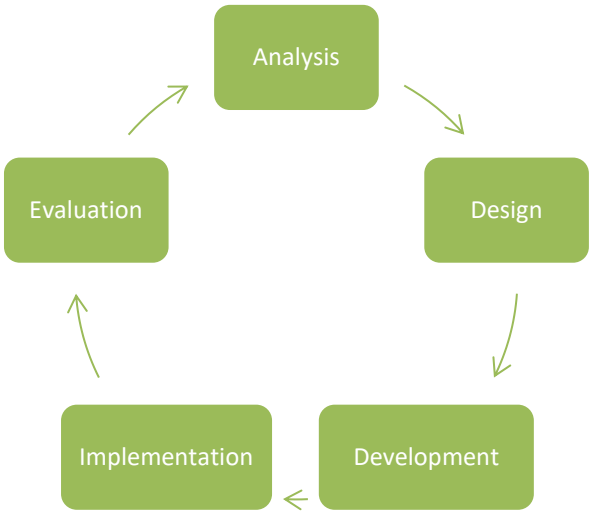

Figure 1 : ADDIE Model (Wikipedia)

In the ADDIE Model, the **A**nalysis step defines the goals of the course; the **D**esign step determines learning objectives, content and teaching methods, subject matter analysis, exercises, lesson planning, assessment

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instruments and media selection; the **D**evelopment step ignites the production and testing of the methodology being used in the project; the **I**mplementation step reflects the continuous modification of the course to make sure maximum efficiency and positive results are obtained; and the **E**valuation step is the stage in which the project is being subjected to meticulous final testing regarding the what, how, why, when of the things that were accomplished (or not accomplished) of the entire project.

As such, this Step-By-Step Guide is a generic guide which in essence can be applied to any existing course. As the input from the questionnaire will be treated as the primary data in the description and application of the ADDIE model in this deliverable, the main focus will be on the first three steps – Analysis, Design and Development – and less detailed focus on the latter two steps – Implementation and Evaluation.

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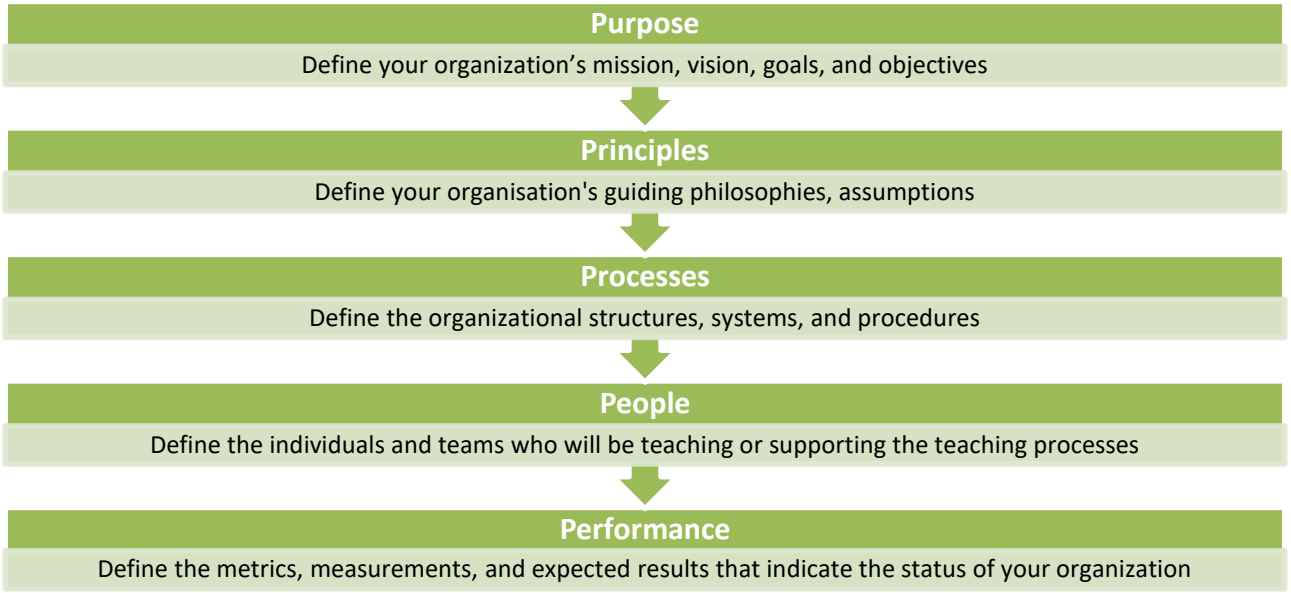
STEP 1: Analysis

Before starting to develop the teaching or training contents or strategies, the first step in the ADDIE Model – the Analysis step – requires the teacher to analyze the current situation and to produce a strategic training plan. The Analysis stage can be considered as the "Goal-Setting Stage" and here we will integrate the 5 P's Model, developed by Pryor, White and Toombs in 1981[2], into this stage with the main aim to bring the teacher or facilitator to analyse and evaluate the current status of the course as a means of adding value to higher education institutions' and training organisations' internal training strategy.

Understanding and using management models, standards, and assessment tools, in conjunction with quality concepts and tools, can help ensure that HEIs and other training providers survive and flourish over the long term. The use of strategic planning will help HEIs and training providers:

(1) to document and improve processes;
(2) to understand learners' needs and requirements and ensure that the courses meet those needs and requirements; and
(3) to streamline the relationships between learners, teachers and the external environment.

Table 1: 5 P's Model (Pryor, White and Toombs in 1983)



Define the purpose

When developing a new course or the revision of an existing course, careful planning and continual revision is key to the implementation of a successful course. The planning phase may either take place individually,

[1] Pryor, M. G., White, J. C., and Toombs, L. A., *Strategic quality management: A Strategic, Systems Approach to quality*, Thomson Learning, 1998.
[2] Pryor, M. G., White, J. C., and Toombs, L. A., *Strategic quality management: A Strategic, Systems Approach to quality*, Thomson Learning, 1998.
[3] Pryor, M. G., White, J. C., and Toombs, L. A., *Strategic quality management: A Strategic, Systems Approach to quality*, Thomson Learning, 1998.

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by the course-responsible alone, or in a participatory way if the course is taught in a team or if external teachers or experts are used.

Before starting to build the skeleton of the course – i.e. defining the learning outcomes, methods, tools etc. - it is useful to reflect on the *reasons* why either a new course is being activated or why an existing course is being reactivated. Ask yourself if the course is being (re) activated in response to a specific need? If so, which kind of need?

- To improve personal and transversal skills of the learners?
- To improve the technical and knowledge competences of the learners?
- To respond to requests on the job market?
- To respond to general sector specific issues?
- Or are there other needs or reasons?

Reflecting on the underlying reasons – either single-handedly or in a participatory way – may lead you to think more thoroughly about the aims of your course and to identify the main strong points, opportunities and threats. If, for instance, the main reason for (re)activating your course is to improve personal and transversal skills of the learners or to improve the technical and knowledge competences of the learners, then this should be reflected in the description of the learning outcomes.

Define the principles of your organisation

In the 5 P's Model, the concept of "Principles" is defined as the guiding principles, philosophies or assumptions that guide the organisation and its business, this concept includes ethic and own organisational culture.

Some higher education institutions and training providers have already in place guiding principles or philosophies that lead the organizational culture and values and which are mirrored in the main objectives of the course structure. These may take the form of quality assurance procedures which most higher education institutions have in place for managing quality in learning and teaching to develop a systematic approach to curriculum development and thereby learning outcomes and related assessments, course outlines, lesson plans with specific instructional techniques, grading systems and evaluation methodologies. Usually, higher education institutions' policies are implemented at faculty level which then may be translated into a faculty policy, strategy and procedures reflecting the organisation, quality culture and traditions of the faculty.

While principles are the core values of an organisation to which employees – here teachers and trainers – are expected to make a commitment when employed, often such principles may not be thoroughly conveyed by the leader or properly understood by the teaches themselves. Thus, in the strategic planning phase, it may be useful to identify your organisation's guiding principles and the organizational culture and values and actively mirror these principles in the drafting of the course.

From the ASKFOOD Questionnaire, several different guiding principles were identified, but could be categorized into the following main headlines:

- Principles guiding the definition of learning outcomes
- Principles influenced by the external environment
- Principles guiding teaching

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- Principles guiding learning

Below an excerpt of the replies that were given:

Table 2: Replies questionnaire to "Guiding principles"

Categories of guiding principles	Examples
Principles guiding the definition of learning outcomes	• *"an engineer should be able to communicate with ease and using any format"* • *"preparing professionals for XXI century demands, people who learn to learn, who learn to work with others, who have new ideas, that have strong initiative"* • *"Train people able to analyse food and food products for consumption"* • *"The dietitian must have a basic background on food safety"* • *"to prepare our students best for their carrier entry - to be able to transfer specific knowledge to practice - to adopt specific knowledge to cope with a specific task"* • *"The students need to know how to control the hazards and cross contamination in food premises"* • *"Principle is to design a course that allow students to understand behaviour of complex food products"* • *"Add cross-cutting skills to scientists"*
Principles guiding external environment	• *"adaptation to the industry requirements"* • *"The food companies are interested to get absolvents with knowledge in food safety and hygiene"* • *New technologies, sustainable processing*
Principles guiding teaching	• *"active participation of student"* • *"Phenomenology. Student-centred learning. Student-active learning. Experiential learning"* • *"active learning, accountable talk"* • *"flipped classroom for individual learning paths, peer-to-peer learning, providing opportunity for practical experience"*
Principles guiding learning	• *"problem based learning, Openness to new ideas and concepts, Creative but Strategic thinking"* • *"Goal-oriented and result-driven"* • *"Ongoing learning, ethical and sustainable approach to management, learning through experience"* • *"Durf te leren (Do not be affraid to learn)"*

Define the processes

The concept of "Processes" is defined as a variable that represents organisational structure, internal systems, rules and procedures used by the organisation to produce its products and services. Such rules, procedures or systems could be Dublin descriptors, certification rules, ISO criteria, internal/organisation procedures, etc.).

Identify the people

In the 5 P's Model, the concept of "People" is defined as people or teams that perform a job in a coherent manner with the principles and processes of the organisation to achieve its goals. Here it may be useful to:

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- Describe the educational and professional background of the teacher
- Whether external experts should be involved and what should be their role(s) and responsibilities
- Whether additional tutors are involved and what should be their role(s) and responsibilities

Identify performance

In the 5 P's Model, the concept of "Performance" is defined as all performance metrics, measures and results that should be used as support or aid to the decision-taking. In this context this would be applied to the assessment tools and use of the assessment results and comments of the module/course. Here it may be useful to outline the tools used to evaluate the performances of the course:

- Quality evaluation questionnaires to be distributed to the trainees/learners at the end of the module/course
- Quality evaluation questionnaires to be distributed to the trainees/learners after a certain time from the end of the module/course
- Success rate of the final examination
- Number of enrolled trainees/learners edition by edition (or year by year)

And also to consider how you plan to use the results of the performance tools to improve/modify the module/course.

STEP 2: Design

The purpose of the ***Design stage*** is mainly to determine the goals of the course and hereby the learning objectives, and to explore the teaching and assessment tools.

Identify the target group

Identifying the target group in terms of age, nationality, previous experiences and interests, educational goals, past knowledge levels, experiences, cultural background sets a solid basis for understanding the learners' needs.

Identify the learning objectives

Learning outcomes are statements of what an individual knows, understands and is able to do on completion of a learning process[4]. As such, learning outcomes are an expression of the expected learning (knowledge, skills, competences etc.) that individual students of a course are expected to be able to demonstrate after completion of the course. Graduates of food science and technology need many diverse skills to meet the needs of a globalized food and drink sector – not only food-specific or scientific/technical skills but also generic or intuitive soft skills which are broadly applicable across job titles and include interpersonal, communication and social skills. [5]

While there is no specific definition of the skills specific to the field of food science, we will draw on a few publications from the field to shortly describe three concepts of skill development used for the definition of learning outcomes:

[4] ECTS Users' Guide (2015), Brussels: *Directorate-General for Education and Culture*. http://ec.europa.eu/education/lifelong-learning-policy/doc/ects/guide_en.pdf.

[5] Flynn, K., Ho, P., Vieira, M. C., Pittia, P., Rosa M. D. (2017), Food Science and Technology Students Self-Evaluate Soft and Technical Skills, *International Journal of Food Studies*, 6, 129-138. doi: 10.7455/ijfs/6.2.2017.a1

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Soft skills

Recent research on skill requirements for successful employment has pointed to the importance of soft skills; also called personal attributes, character traits or generic, transferable or generalizable skills. In a study carried out within the Track Fast project, the results suggested that improvements in FST training, particularly the acquisition of 'soft skills' will improve Europe's food workforce as these are the skills employers most desire. In this study, the following soft skills were identified as the most desirable[6]:

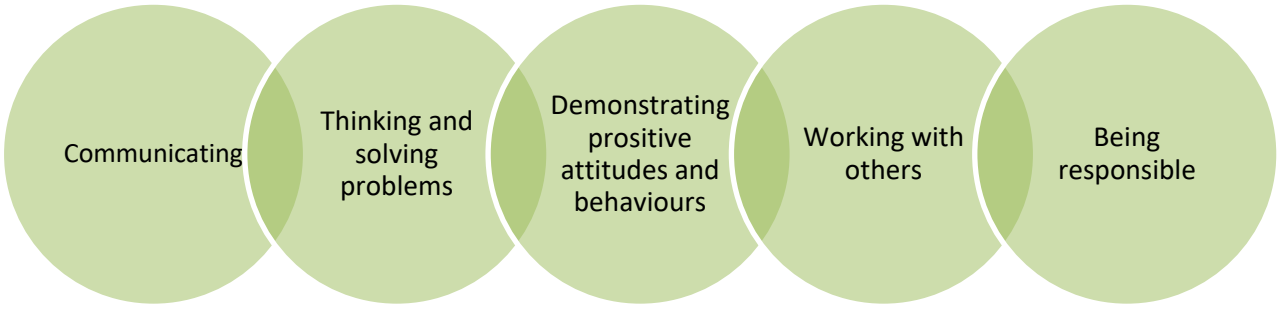

Figure 2: List of soft skills identified in the study by Flynn et al (2013)

From the ASKFOOD Questionnaire, the following soft skills were identified by the respondents (by open ended answers):

6 Flynn, K., Wahnstr•om, E., Popa, M., Ruiz-Bejarano, B., & Quintas, M. (2013). Ideal skills for European food scientists and technologists: Identifying the most desired knowledge, skills and competencies. Innovative Food Science and Emerging Technologies, doi: 18, 246{255.

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Figure 3: Soft skills identified in ASKFOOD questionnaire

Transversal skills

Transversal skills refer to skills that may not be directly related to a specific field of work or academic discipline but are rather considered to be related to situations and work settings. Examples of transversal skills may include: Critical and innovative thinking; Inter-personal skills (e.g. presentation, organisation skills, etc.); Intra-personal skills (e.g. self-discipline, enthusiasm, self-motivation, analytical and problem-solving skills, etc.); IT skills including the ability to locate and access information, as well as to analyse and evaluate such information; Accurate record keeping and report writing; Numerical and statistical awareness; Project management skills; and Time management [7]

The following transversal skills were identified (by open-ended answers) in the ASKFOOD Questionnaire:

[7] UNESCO Asia-Pacific Education Policy Brief (2014), Skills for Holistic Human Development, http://www.unescobkk.org/fileadmin/user_upload/epr/PDF/Policy_Brief_Vol2-28_Nov.pdf

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Figure 4: Transversal skills identified in ASKFOOD questionnaire

Technical skills

In the study carried out by Flynn et al. (2013) as mentioned above, food sector skills or technical skills analyzed were identified and the three most desired among them were:

- Product Development,
- Food Legislation & Control and Food Safety Management
- Food Hygiene & Food Safety Control. [8]

While in the ASKFOOD Questionnaire, most respondents described the technical skills relatively close to the definition of the course topic, the following technical skills could be connotated which are closely connected to those identified by Flynn et al. (2013):

[8] Flynn, K., Wahnstr•om, E., Popa, M., Ruiz-Bejarano, B., & Quintas, M. (2013). Ideal skills for European food scientists and technologists: Identifying the most desired knowledge, skills and competencies. Innovative Food Science and Emerging Technologies, doi: 18, 246{255.

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Figure 5: Technical skills identified in the ASKFOOD questionnaire

Formulation of learning outcomes

One way of formulating learning outcomes is to do it in accordance with the European Qualifications Framework (EQF) which is one of the most established way for categorising learning outcomes and to compare national qualifications. The core of the EQF concerns eight reference levels describing the learning outcomes in terms of knowledge, skills and autonomy-responsibility. Knowledge is described as theoretical and/or factual; skills as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments); and responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility. [9]

[9] European Commission (2018), Descriptors defining levels in the European Qualifications Framework (EQF), https://ec.europa.eu/ploteus/en/content/descriptors-page

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Table 3: Levels of the European Qualifications Framework (https://ec.europa.eu/ploteus/en/content/descriptors-page)

	Knowledge	**Skills**	**Responsibility and autonomy**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
Level 6	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

The wording of the learning outcome needs to be carefully considered. A widely accepted way of formulating learning outcomes is based on three essential elements:

1. Use active verbs to express what learners are expected to know and be able to do (e.g. graduates must be able to 'describe', 'implement', 'draw conclusions', 'assess', 'plan', etc.)
2. Specify what this outcome refers to (object or skill e.g. can 'describe techniques that can be used to monitor quality of raw ingredients', etc.).
3. Specify the way of demonstrating the achievement of learning outcomes (e.g. 'to explain the chemistry underlying the properties of various food components' or 'to interpret statistical data as used in food science applications', etc.).[10]

Having determined and formulated the learning objectives of your course, will then help you make decisions about which content to include, which teaching methods to use, and what kinds of assessment methods are appropriate.

Identify the structure of the teaching setting

Once you have identified the learners' needs and learning objectives, you should as teacher consider how you want to present the content of your course. You may want to consider the following teaching settings, not necessarily individually but in combination:

- Plenary lecture
- Group work[11]
- Team work[12]
- Practical
- Online
- Excursions
- Guest lectures
- Role plays

While the choice of teaching setting to a large extent depends on the size of your learner group, it also depends on several other factors, which our survey has shed light on. Plenary may not necessarily, as may be expected, be used for larger groups of learners, but rather as a means of conveying theoretical knowledge or as instructions for laboratory practices at the beginning of a teaching setting, and then combined with other types of settings such as group work, team work, practicals or online methods. In the survey, it was found that plenary is used among more than 83% of the courses in combination with the other types of teaching settings such as group work, team work, practicals, and online.

[10] ECTS Users' Guide (2015), Brussels: *Directorate-General for Education and Culture*. http://ec.europa.eu/education/lifelong-learning-policy/doc/ects/guide_en.pdf.

[11] "Group work" was defined in the ASKFOOD survey as a teaching setting where trainees/learners are divided in small groups and work together on specific tasks/activities; each trainee/learner will submit the final report/product and be assessed individually);

[12] "Team work" was defined in the ASKFOOD survey as a teaching setting the trainees/learners are divided in teams that work together on specific tasks/activities; the team will submit the final report/product and it will receive an overall assessment.

Identify the teaching methods

To adapt teaching to the needs of the learners in an ever-changing environment new and innovative teaching methods offer great opportunities for efficient transfer of knowledge and skills, which is also shown in the ASKFOOD questionnaire. In the questionnaire, we identified a number of innovative teaching methods and respondents were asked to indicate the mix of methods applied. Some respondents also indicated other methods. In essence, combinations of different teaching methods were and not a single course responsible identified only one teaching method. Those teaching methods chosen most frequently were "case studies" followed by "peer learning" and "flipped classroom" as indicated below:

Teaching method	Number of respondents
Case studies	54
Peer learning	31
Flipped classroom	28
Blended training (MOOC/E-learning supported)	22
Gamification	9
Micro-learning	4
Serious gaming	2

Also other methods, not listed, were mentioned:

- "Role plays or real situations in which students have a facilitation goal to perform."
- "working out a business model an e-commerce site in a team."
- "CoWorking Lab, for a profitable involvement of students in innovation path"
- "learning by doing"
- "collaborative and active learning"
- "Active learning and critical thinking"
- "computer practical, lectures"
- "also (statistics and modelling) software based practicals"
- "Workshops, public meetings"

Below, a list of those teaching methods from which the respondents could chose, are described in detail:

Flipped Classroom

Flipped classroom is a type of learning that tilts the traditional learning environment by delivering instructional content, often online through ppt presentations or videos, outside of the classroom and then moves more learner-centred activities such as discussions, experiments, skill development, problem-solving exercises with the help of the teacher into the classroom.

In our survey, flipped classroom is used in among 41% of the courses, and in most cases in combination with case studies and blended learning (see descriptions below). While flipped classroom was selected less frequently in relation to soft skills, but more in combination with transversal skills (such as problem-solving, critical and digital skills) and technical skills, this may suggest that flipped classroom is used to foster a learning environment within which the development of transversal skills can flourish to a larger extent because the teacher can spend more time and efforts on exercises where such skills are brought to the foreground and where for instance digital skills are practised online.

Blended training (MOOC/E-learning supported)

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Blended learning is a teaching method that combines online learning such as e-learning with traditional classroom methods.

In our survey, blended learning is used in among 31% of the courses, and in all cases in combination with flipped classroom, and in nearly all cases in combination with case studies. While blended learning has been criticised for being applied mainly in larger groups of learners, our survey does not confirm this trend. Rather this method is used for all sizes of learners. One of the respondents where both flipped classroom, blended learning and case studies was selected in combination, when asked to describe the teaching methods, responded: *"Mostly PowerPoint presentations, showing theoretical background and real-life examples. Using videos and sharing experiences from the professional life of trainers/students. Encourage them to observe and ask."* This description very well captures the essence of all three methods combined.

Micro-learning

Micro-learning is a means of teaching and delivering content to learners in small and short videos where the learners are in control of what and when they are learning. While originally designed for professionals as an innovative, effective and simple way of condensing information on easy to access platforms, the higher education sector is increasingly beginning to encroach upon microlearning as a teaching tool. This happens as also the way in which students learn is changing and so are the platforms on which they learn.

In our survey, micro-learning is used in only 5% of the courses, and in all cases in combination with flipped classroom, blended learning and case studies. And while none of the respondents mention "micro-learning" specifically in the description of the teaching methods, this may be more of an indication that students are encouraged to use micro-learning (such as short videos) as part of the online learning materials as preparation materials.

Gamification

Gamification is the application of game mechanics in a non-game environment in order to enhance or change behaviour of learners with the main aim to increase motivation, engagement, and enjoyment in completing assignments. As such, gamification can take many forms and be integrated into the teaching environment differently. For instance, it can be used by giving learners "missions" instead of assignments, allowing them to "level up" as they progress through grade points, and generally using a flexible approach to student learning. As such, gamification can potentially increase engagement among students by using terminology and concepts with familiar connotations. Students receive rapid feedback, a feature with which they are familiar from video games and apps.

In our survey, 6% of respondents indicate that they use gamification as a teaching method, however, all of them in combination with flipped classroom and blended learning.

Serious gaming

Serious Games are games that are designed for a primary goal different from pure entertainment. As such, serious games offer the opportunity for learners to use modern technologies to give problem-solving experiences; provide situated experience in which students are involved in complex problem-solving tasks; strategic thinking; the use of logic, memory, problem-solving, and thinking skills. [13]

[13] https://www.intechopen.com/books/simulation-and-gaming/educational-games-in-higher-education

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In our survey, only in 2% of the cases, serious games are used as a teaching method, and in those cases in combination with flipped classroom, blended learning, micro-learning and gamification.

Case studies

Case studies are descriptions of a real-life experience, related to the field of study or training, which are used to make points, raise issues or otherwise enhance the participants' understanding and learning experience. The account usually follows a realistic scenario, such as a management or technical problem, from start to finish. Because they provide practical examples of problems and solutions, challenges and strategies, they support more theoretical material and often make the "lesson" more memorable and believable for the class.

In our survey, is case studies are used by 73% of the respondents, as described above mainly in combination with other teaching methods. This also suggests that case studies – as a teaching method – fosters not only the exchange of knowledge among the team members, but also facilitates the development of soft and transversal skills.

Peer learning

This learning methodology involves individuals exchanging knowledge and experience with each other and diffusing this learning back to their organisations to ensure an impact. While peer learning entails complex organisational logistics, it avoids the risk of focusing on process rather than product. It recognises that ultimately learning takes place between individuals and it facilitates interpersonal interchanges that are well-matched and that are based on trust and commitment. Peer learning can be evaluated based on whether peer engagements and sustained individual contacts produced the right learning outcomes for the right individuals to achieve changes which matter.

In our survey 43% of respondents indicate that they use peer-learning as a teaching method. Peer learning is especially used, in our survey, for engendering soft and transversal skills such as communication, team interaction, inter-personal skills; problem-solving and critical thinking which to a large extent is mirrored in the objectives of this teaching methodology, namely to foster learning between individuals to facilitate interpersonal exchanges.

Identify the assessment methods

Assessment methods are techniques, tools and instruments used for collecting information to determine the extent to which students demonstrate desired learning outcomes. While there is a wealth of different assessment methods in place in higher education institution, in the ASKFOOD questionnaire, the majority of respondents chose a mix of different assessment methods, nevertheless, the method "written report" and "open question exam" was chosen as the most often used method as indicated below:

Written report	43 respondents = 64%
Open question exam	38 respondents = 57%
Oral exam	27 respondents = 40%
Multiple choice exam	26 respondents = 39%
Pitch competition	4 respondents = 6 %

Besides these methods of assessment, the following were mentioned:

- *Coursework e.g. reports/videos/blogs*

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- *Professional Product ("Beroepsproduct") with description; Video portfolio; Executive summary*
- *Structured question paper*
- *Presentation of the outcomes of the groupworks*

In some cases, the assessment method was combined with the Evaluation step in the sense that self-evaluation reports are considered as part of the assessment.

Multiple choice exam
Belonging to the field of formative assessment, conducted during the learning process in order to modify teaching and learning activities to improve student performance and typically involved qualitative feedback, multiple choice exams can be either web-based or paper-based. In multiple choice exams or objective assessments, as they are also called, respondents are asked to select only correct answers from the choices offered as a list.

Open question exam
Written exams with open questions can require the student either to respond by giving short answers or can be structured as essay-type questions which require an answer that is structured in the same way as an essay or report. While essay-type exams offer students an opportunity to demonstrate knowledge, skills and abilities in a variety of ways not being bound to selecting from a list (like in multiple choice exams), they can also be used to develop students' ability to formulate arguments, reasonings and provide evidence.

Oral exam
In comparison to open question exams in written form, in oral exams students not only demonstrate their knowledge of a subject matter, they also demonstrate their presentation, speaking and interpersonal communication skills.

Written report
Unlike essays, as explained above, a written report is prepared for a clear purpose and specific information and evidence is presented, analysed and applied to a particular problem or issue. The information is presented in a clearly structured format making use of sections and headings so that the information is easy to locate and follow.

Pitch competition
Used as a relatively recent form of assessment in higher education, pitch competitions are in essence competitions where students are invited to come up with innovative ideas or solutions to a specific and real-life problem and share their insights and practical solutions with peers.

Typically, students will strengthen their presentation skills, their problem-solving skills by finding solutions to a real-life problem while also developing teamwork skills and learning from the peers involved.

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Matching learning outcomes with teaching and assessment methods

Similarly to Nightingale et al (1996)[14] who provided a list of eight broad categories of learning outcomes combined with categories of suitable assessment methods, we have sought, on the basis of the data from the questionnaire, to combine teaching methods and assessment methods with identified learning outcomes (here as soft, transversal and technical skills). In doing so, we have picked those skills that were mentioned most often and listed those teaching and assessment methods chosen by the respondents:

Soft skills	Teaching method(s)	Assessment method(s)
Communication	Blended learning; Micro-learning; Case studies; Peer learning	Open question; Multiple choice; Oral exam; Written report
Team work	Blended learning; Case studies; Micro-learning	Open questions; Written report; Oral exam, Multiple choice
Effective interaction in teams	Peer learning; Case studies	Oral exam; Written report

Transversal skills	Teaching method(s)	Assessment method(s)
Inter-personal skills	Case studies; Peer learning	Open question; oral exam; Written exam
Innovative thinking	Blended learning; Gamification; Case studies;	Open question; written exam; multiple choice
Digital skills	Flipped classroom; Blended classroom; Case studies; Peer learning	Multiple choice; open question exam
Problem-solving skills	Flipped classroom; Blended classroom; Case studies; Peer learning	Multiple choice; open question exam
Critical thinking	Case studies; Peer learning; Blended learning; Gamification; Flipped classroom; serious gaming	Open question; written exam; Multiple Choice; Pitch competition

Technical skills	Teaching method(s)	Assessment method(s)
Hygiene	Blended; Microlearning; Case studies	Open question; oral exam; Written exam; Multiple choice
Product handling	Flipped classroom; Case studies; Peer learning	Multiple choice; Oral exam; Written report
Software application	Flipped classroom; Blended classroom; Case studies; Peer learning	Multiple choice; open question exam
Food safety control	Case studies; Blended learning	Open questions; Multiple choice; laboratory practice
Food legislation	Active learning; Case studies; Blended learning	Oral exam; Open questions; Multiple choice

[14] Nightingale, P., Te Wiata, I.T., Toohey, S., Ryan, G., Hughes, C., Magin, D. (1996) Assessing Learning in Universities Professional Development Centre, University of New South Wales, Australia (https://www.brookes.ac.uk/services/ocsld/resources/methods.html)

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Practical competences in lab	Blended learning; Case studies	Open question; written report
Product development	Case studies; Peer learning; Flipped classroom	Multiple choice; Oral exam; Written exam

The alignment of teaching and assessment methods is also in line with the relatively new assessment culture that sees assessment as a tool for learning and not only as a means to determine grades and that emphasises the integration of instruction and assessment so as to align learning more with assessment. [15]

STEP 3: Development

Essentially, the **Development** step is the step in which the teacher creates and assembles the content – the defined learning outcomes, the selected teaching setting and teaching methods - as created in the Design step and brings these parts to live.

STEP 4: Implementation

After the Development step where the teaching materials have been developed and the teaching methods and tools selected, the Implementation step is where all this is transferred to the target audience and the learning process can begin. As such, the implementation may include the following main steps:

1. **Train the people**
   In the Analysis step, you will have considered who will be involved as teachers in the delivery of the course content. This can be other subject-matter experts, tutors, external experts or other instructors. Involving several people as teachers implies that all necessary materials must be ready well before the course begins to enable other teachers enough time to review the materials, and for them to get familiar with the application of the teaching methods chosen.

2. **Prepare the learners**
   Having trained the people, the next step of the implementation process is to prepare the learners for the upcoming learning process. This making sure that they are familiar with the tools (for instance specific software, e-learning platform etc.) that they have the knowledge required for completing the course, that they are aware for the course's goals and its schedule. It may be necessary to include a few hours of preliminary instruction on such preparational issues in the beginning of the course.

3. **Prepare the environment**
   Depending on the chosen teaching method and the correlated technical and organizational requirements thereof as formulated during the Development step, this step involves all practical preparations related to the course such as setting up visual facilitations (such as projectors or screens); setting up audio; downloading necessary software; supplying white boards or markers;

[15] van de Watering, G., Gijbels, D., Dochy, F. et al. High Educ (2008) 56: 645. https://doi.org/10.1007/s10734-008-9116-6

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preparing print-outs. An adequately prepared environment ensures that both teachers and leaners can concentrate on the learning process. [16]

STEP 5: Evaluation

The Implementation and Evaluation step are closely intertwined in the sense that the teacher(s) and learners should consistently and actively analyze, redesign and enhance the course to ensure effective delivery. And here proper evaluation plays an important role which should lay the foundation for modifications making the course more effective and successful.

Evaluation may take many forms:

- Teacher evaluation forms asks learners to evaluate the teachers' , strengths and weaknesses of the presentation, and ideas for course improvements.
- Self-assessment asks learners to evaluate how he/she increased his or her knowledge and skills

More literature to be found on https://www.tandfonline.com/doi/full/10.1080/02602938.2018.1466266

[16] https://elearningindustry.com/getting-know-addie-implementation

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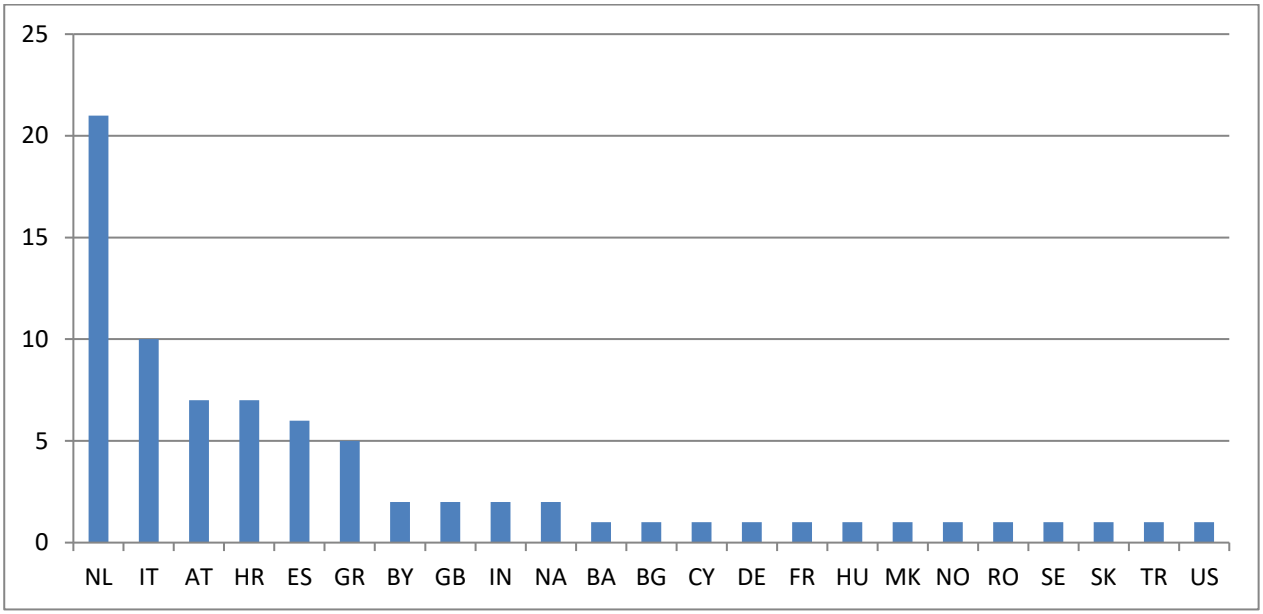
Annex 1: Background data of survey

Country

Number of respondents: 77 from 22 different nationalities (2 were not given).

Figure 6: Distribution of respondents according to country



Organisation type

To the question about "organisation type", respondents could choose between three categories:

- Higher education, and here select either university or college
- Professional training provider
- Other

Table 4: Organisation affiliation and number of respondents

Higher education	University	62	**67**
	College	5	
Professional training provider			**3**
Other: • Consumption school • Food technologist • Higher Technical Education (ITS). ITS pathways represent the non-academic tertiary education and training segment. • Higher Technical Education (ITS). ITS pathways represent the non-academic tertiary education and training segment. • private, Non-Profit, cooperative research institute • Research institute VET Provider, SFC promotes debate surrounding professional training policies and substains synergies between decision makers			**7**
Total number of respodents			**77**

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Annex 2: Course specifics

Respondents were asked to indicate the field of science within which the course is being taught and could choose between natural sciences, social sciences, formal sciences and other. In direct relation to this question, respondents were asked to specify the title of the course to which the following replies appeared specified with regard to the choice of science field:

Table 5: Title of course specified with regard to field of science

Title of course	Natural sciences	Social sciences	Formal sciences	Other
Food Technology	X			
Dairy Technology	X			
Food chemistry	X			
Disseminate science through social networks	X			
Food Engineering	X			
Food Safety Management	X			
Food Chemical Analysis	X			
Food Packaging	X			
Food Science and Technology	X			
Food Safety	X			
Dairy Science	X			
Applied Quality Management	X			
Predicting Food Quality	X			
Hygienic design	X			
Case study Food Safety Management	X			
Mathematical concepts in food technology	X			
Food Structuring	X			
Human Nutrition	X			
Quality Systems Operations	X			
Healthy Food Design	X			
Food Physics	X			
Building biology	X			
Food Technology	X			
Applied Human Nutrition	X			
Sustainable production of vegetables	X			
Food science and technology	X			
Scientific communication	X			
Food, Commerce and Technology	X			
Practical Course in Enzyme Technology	X			
Renewable energy, focus on bioenergy	X			
Healthy diet workshop	X			
Critical and conscious reading of food labels	X			
Cleaning Validation and Hygienic Design	X			
Post harvest management and value addition of fruits and vegetables	X			
Creative Concept- and Product Development	X			
Research Methodology	X			
Sustainable Food Systems	X			
Food Safety and Hygiene	X			

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Starch and confectionery technology	X			
Introduction to food engineering and Food preservation processes	X			
Chemistry and technology of meat and fish	X			
Food toxicology	X			
Human Nutrition and Dietetics	X			
Hygiene and sanitation	X			
Sustainability of advanced thermal and nonthermal food processing techniques	X			
Quality Management Systems	X			
Science and technology of poultry and eggs	X			
food quality management research principles	X			
Agroecology: Action learning in farming and food systems	X			
Food for Growth (F4G)	X			
Social acceptance of food technology	X	X		
Quality management	X	X		
Economics, Public Management		X		
Economics of Agri-Food Networks		X		
Economics, Public Management		X		
Biobased Logistics		X		
Facilitating Interactive processes of change		X		
Introduction to Management and Life Sciences		X		
Cooperatives and Producer Organisations		X		
Applied Information Technology		X		
Logic and Decision Making		X		
comparative private law		X		
Modelling and optimization in nutrition		X	X	
Higher Technician in food design and production technologies;Higher Technician in food product marketing and promotion technology				X
H.T. in food design and production technologies-PW;H.T. in food product marketing and promotion technologies-PW				X

Respondents were also asked to indicate the teaching language:

English	27
English and national language	16
National language	34

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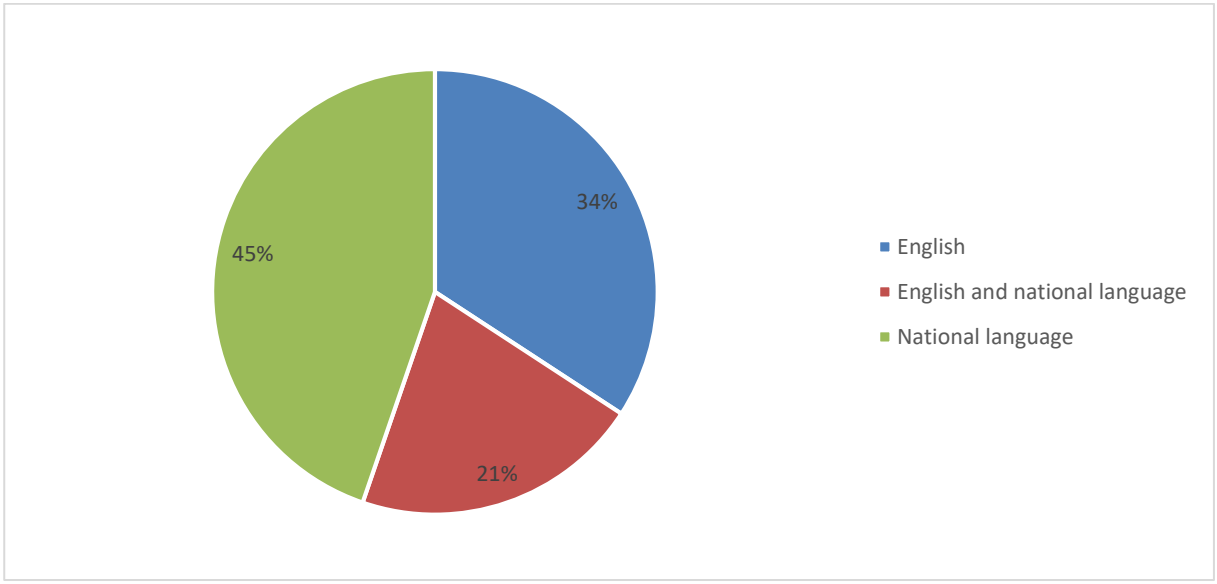

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Annex 3: Learners

For the 67 courses taught at HE institutions (universities and colleges together), 60 are taught to students only and 7 taught to a mix of students, teachers and professionals.

Respondents were asked to indicate the number of learners enrolled in the course. Among the 67 courses taught at HE institutions:

Courses specified with regard to number of enrolled students	**Courses**
more than 40 students enrolled	32 courses
between 20-30 students enrolled	17 courses
between 10-20 students enrolled	9 courses
between 30-40 students enrolled	4 courses
have less than 10 students enrolled	3 courses
N/A	2 courses

Among the 67 courses taught at HE institutions, the learners have the following educational background:

Level of study	**Number of courses**
BA only	27
BA + Master	9
Master only	21
Master + PhD	2
PhD only	2
BA + PhD	1
BA+Master + PhD	4
N/A	1

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Annex 4: Teaching setting

Among the 67 HE courses, whereas 56 use plenary as part of the teaching setting, only 5 of these use plenary only, the remaining teachers use a combination of plenary, group work, team work, practicals, online and other settings. Several different combinations could be identified and linked to the number of students enrolled in the courses:

Number of learners	Teaching setting
Less than 10 learners (3 courses)	• 3 courses use plenary • 2 courses use group work • 1 courses use team work • 3 courses use practicals • 2 course use online

Between 10-20 learners (9 courses)	• 6 courses use plenary
	• 5 courses use group work
	• 4 courses use team work
	• 3 courses use practicals
	• 2 courses use online
	• Others:
	  ○ "Combination of plenary lecture, team work and labiratory practices";
	  ○ "looking for reseach publications, analysing and discussing these works"

Between 20-30 learners (17 courses)	• 16 courses use plenary
	• 9 courses use group work
	• 8 courses use team work
	• 8 courses use practicals
	• 2 courses use online
	• Others:
	  ○ "writing analytical reviews of literature, course work";
	  ○ "Individual extracurricular tasks on selected topics";
	  ○ "Individual work"; "excursions, guest lectures, role plays";

Between 30-40 learners (4 courses)	• 2 courses use plenary • 1 course use group work • 1 course use team work • 1 course use practicals • 0 courses use online • Others: ○ "FLIPPED CLASSROOM; INTERACTIVE TEACHING; THINK, PAIR SHARE.";

More than 40 learners (32 courses)	• 29 courses use plenary
	• 11 courses use group work
	• 16 courses use team work
	• 19 course use practicals
	• 8 courses use online
	• Others:
	  ○ "Lectures and laboratory";
	  ○ "Tutorials";

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	○ "simulation games"; ○ "In class discussion of the additional readings assigned by the instructor; Seminars with professionals and experts"; "discussion sessions held and organised by learners, crisis management protocol writing, crisis simulation"; ○ "Tutorials: students can practice relevant exercises, while getting personal help from teachers or peers."

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Annex 5: Teaching methods

While respondents chose a mix of different teaching methods, “case studies” was used most often, followed by “peer learning” and “flipped classroom” as indicated below:

Teaching method	Number of respondents
Case studies	54
Peer learning	31
Flipped classroom	28
Blended training (MOOC/E-learning supported)	22
Gamification	9
Micro-learning	4
Serious gaming	2
Others: ○ “Role plays or real situations in which students have a facilitation goal to perform.” ○ “working out a business model an e-commerce site in a team.” ○ “F4G adopts 2 main methodologies: Flipped Classroom & CoWorking Lab, for a profitable involvement of students in innovation path” ○ “learning by doing” ○ “collaborative and active learning” ○ “online tests, quiz” ○ “Active learnig and critical thinking” ○ “computer practical, lectures” ○ “also (statistics and modelling) software based practicals.” ○ “traditional lectures and tutorials + online knowledge clips + recordings of lectures” ○ “traditional teaching” ○ “Workshops, public meetings”	

Respondents were asked to describe the teaching methods and/or sequence of conduction in their own words (max. 200 words):

In the morning discussion of the tasks to do in the laboratory, input on the necessary theoretical background (slides, discussion, brainstorming). Then start of the labwork in teams of 2 or 3. Supervision by tutors during the day. Data analysis in the evening together with tutors. Final discussion of the practical course on the last day, preparation of "scientific articles" by the teams. Grade is given after submission.
Presentation using PPT and Flipchart/Whiteboard for basic information, individual work with provided material for practical use of the knowledge from the lectures, written reports
Students carry out research at home while engaging in concepts in the classroom with the guidance of a mentor.
Mostrly powerpoint presentations, showing theoritical backround and real life examples. *Using videos and sharing experiences from the professional life of trainers/students. Encourage them to observe and ask.*
lectures, practical exercises, laboratory exercises
Power point slides for lectures and group works. Each student works separately at the laboratory.
First thing I do is announce my next lecture in the class. I ask my students to come prepared to the class. Then I start my lecture asking some basic questions regarding the topic to know the level of class for that particular topic. And I prefer to use white board and market for teaching. At the end of the class I do a quick revision of things taught and what to learn from today's class.

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through the use of social networks it is possible to communicate impact science. The methodology must adapt to the channel used and the type of user.
IT enabled teaching using powepoint slides, case study methods using projectors coputers and related AV aids
Lectures are suported by practical work and e-learning. The group and team work combines knowledge and skills from lecture and practical part and by oral presentation and listening to colleagues present the development of knowledge and skills of informal education.
Students are presented with background information on dissemination of scientific data (from strategic options to tools and tricks to use when creating an abstract, poster, oral communication). They are then asked to apply these tools to present one research project (that they have been developping in the previous year) to other students in a conference setting, including questions and feedbacks
The aim of the course is to give the student the opportunity to develop skills in developing and communicating innovative food and meal solutions from idea to finished product. In addition, the course will highlight the most common methods for pursuing successful product and service development in the food and eating area.
The group/team began discussing some questions. Onece they disi this they expose their answer (not all the grupos have the same questions). Then they can read short presentations on the opinion by the experts on those subject, they compare their own thinking and the expets.
Lectures - presentations on topics in accordance with the curriculum, mini-tests (5-8 questions, maximum 10 minutes), practical classes - individual tasks, presentations of students on specific topics, course work - calculating or research (including the proposal of food enterprises); control of knowledge - check of individual tasks and course work, exam.
Lectures and Laboratories training
LECTURES AND DISCUSSION, PROBLEM SOLVING AND DEMONSTRATIONS
Mainly frontal lectures with Power Points; soliciting interaction with the students by means of Q&A; in class discussion of the additional readings assigned by the instructor
Using slides for the teaching in 2 Semesters with 20 hours in each
Each team is a food safety team that has to build the HACCP system of a food company. Within 12 weeks they have to implement the 12 steps of HACCP and deliver the final report. Meanwhile at the plenary lectures the get all the necessary theoretical background
Students are receiving a task to be solved (i.e. to design and realise an innovative sweet product as candy, jelly, chocolate, foams, bonbons). At the end of semester, the teams present their product to a mini-symposium.
It starts with theoretical knowledge (repetition and new inputs), then mathematical solving of problem, lab practicals and case studies
Plenary lectures and active learning are combined, student seminars and practical work in the laboratory, meat product production and a visit to meat industry
theoretical content is explained either as plenary lecture or online; then students work together in groups/alone in case-solving or in practical lessons at labs ; they also collaborate as a whole team in a common project
The course is structured into 3 parts: *a, Lecture (Transfer of basic knowledge; Intermediate examination)* *b, Seminar (Build 12 teams of 5 students each, Define contents of group works (selected topics), Create project schedule with the QM-documents (SMARTSHEET), Provide forums for communication (BOKUlearn), Define core process in detail (iGraphX) as well as corporate identity, Elaborate jointly documents around the main topic, Evaluate and adjust outcomes (Actual/target analysis, feedback)* *c, Presentation (Present team works in context of the virtual industrial setting)*
After few lectures the students can self-evaluate themselves by online tests (the online tests are not graded, they are used by the students with the purpose of easier learning). The students also get assignments, case studies, whcih they present in front of other students. There are also seminars where

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they actively participate (they get a task before the seminar, and they discuss it during the class). Practical work is in the laboratory were they use standard methods used in real life for hygiene control of processing.
Topic presentation, discussions, practicals, case study presentation, student's presentation and topic discussion
Teaching is organised in 3 parts: plenary courses, seminars and pratical work. Firstly, students are provided with the inforamtion about the course and First lessons are given. Practical work follows lessons. at the end of semester students present their seminary work on chosen subject that is related to case studies.
Lectures is conducted through ppt presentations, seminars held by students
Plenary lectures followed by practical work in laboratory and student seminars
Lectures - presentations in Power Point, short written tests on the main topics of the lecture course, individual tasks for self-training on some topics. Practical lessons - checking the mastering of educational material of the previous lesson (individual written tests, crosswords puzzles, checking terminology knowledge - teamwork for 10-15 minutes); practical tasks for each pair of students, the opportunity to use the teacher's consultation, group discussion of the results of each assignment; homework (topic and necessary literature for the next session). Sometimes in practical classes there may be a performance of students with a prepared presentation on certain issues, for example, an award in the field of quality.
lectures explaining theories, concepts, methods; practicals with teams to apply knowledge from lectures, short presentations to present initial results, feedback peers and teachers, use of research notebooks to make qualitative research moer structured and explicit; peer feedback on assignment reports; teacher consulatation sessions to activate students to take the lead in their own learning process; guest lectures to give more meaning to abstract concepts from literature, expert interviews to train pitfalls in questionnaires and interviews
Three lessons in which theory will be explained using specific tasks/activities and short videos, the fourth is on request when the students need more information about solving the tasks.
Plenary lectures (2h per topic) are given three times a week, the rest of the time is spend on computer practical assignments both individual and as group. Online materials are studied as additional information, tutorials and feedback clips
Lectures: You will be taught concepts, approaches and methods, concerning the application field of circular economy, business management considerations, stakeholder perspectives, systems thinking, sustainability analysis and the dynamics of human and organizational interactive behaviour. Understand principles of LCA and ABM.
text, multiple choice, online case study
The course consists of lectures, case studies, discussions and computer based learning. *The students will be divided into groups, representing either the government, a consumer organisation, primary production, a retail association or food industries in a European country. Per country one food safety topic will be studied. Three or four groups in the same country cooperate, negotiate and produce one joint, advisory report for the national minister.* *During most elements of the course the students will be acting in these groups. Each group is supervised by a staff member, who acts as the director.*
Theory is supplied by knowledge clips that can be viewed at will, and needs to be applied to cases that are specific for the food field. The students work in small groups that prepare the exercise elsewhere and finalise it in the computer room.
The first 1.5 week students practice basic communication and art skills for facilitation and reflect on facilitation processes. Then they form a group of 4 to study, present and try a facilitation methodology in a role play with their colleagues. After the trial they get feedback on the personal facilitation and the effectiveness of the methodology. In the last part of the course, students the students choose a situation that requires facilitation (role play or real life), design and execute a 1.5 hours facilitation processes. This last facilitation process, and an individual observation report on another group's facilitation are

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appreciated and marked. Each facilitation session is followed by peer to peer feedback, and experience shows students are very committed, open and learn a lot from each other.
A combination of lectures and tutorials. Via Blackboard, recordings of lectures are available, as well as sllides, pfd of reader, feedback to exercises.
The teaching methods in this course are rather traditional, except for the team work where they learn from each other under the guidance of a supervisor. Having several lecturers participating in the course (changing almost daily) does not ease the introduction of new teaching methods.
Some courses fully online, others on campus, blended, flipped classroom
Just a few lectures to introduce the basic concepts and most time (80+%) devoted to team work
The course contains many different teaching methods, ranging from traditional plenary (guest) lectures, to individual and group presentations, role plays and excursions. In addition, student teams work on a joint project, to be presented at the end of the course
Students build a business model for an online food store/market in which they work out the role of ICT. They build an e-commerce site in addition.
Interactive lecture including video to be watched before the class. Product design (virtual prototype) based on the lecture content
First lectures and tutorials, followed by practicals
Half of the lectures will be supplemented with practical exercises. *The exercises are performed either on the computer or with measuring devices.* *These exercises are supplemented with questionnaires, which are evaluated online.*
The teaching methods are varied and cover a range of methods with lecturers exploring new methods for changing cohorts
Teaching is carried out through classroom lectures with the aid of slides that represent educational material available in an online platform in pdf format for students
Weekly by three hours, preparing presentation, tests, questionaries, projects items, case studies etc.
socratic + lecturing + tasks assigned to students individually and/or in teams
Students have to study at home (homework is settled one week before). The first lesson they have a test on the content of the homework, in order to assess if they studied. Then I make them focus on the conceptual framework of the week asking students on what they learned and if there are any question about it. Students have to focus on my questions and then we can use the "think- pair-share" method or I can inspire the students to have an accountable talk about the theme by specific questions aimed at making them think deeply on the subject.
Teaching is done mostly in small groups with assignments from inside as well as the outside world, including industry. We combine business studies with food technology to fill an important niche in Dutch food bachelor studies.
We use a phenomenological approach, where experiential and transformative learning play an important role. The immediate experiences of the students are seen as the starting point for the learning process: From experience to connect and to vice versa.

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Annex 6: Learning outcomes

Skills selection and combinations	Description		
Soft skills only (3 courses)	*To think logically and make decisions*		
	Communicating and Thinking		
	Active listening, socrates dialogue, negotiation, use of drama/drawing/poems, find common ground, conflict management		
Soft + technical skills (7 courses)	**Soft skills**	**Technical skills**	
	written and oral communication, team work	*hygiene, engineering, microbiology*	
	Communicating, Thinking & Solving Problems Demonstrating Positive Attitudes & Behaviours Working with others	*Product Development, Food Legislation & Control and Food Safety Management, Food Hygiene & Food Safety Control*	
	communication skills	*Food Hygiene & Food Safety*	
	critical thinking, problem solving, communication abilities	*decision making, logic reasoning, strategic thinking*	
Soft + transversal skills (6 courses)	**Soft skills**	**Transversal skills**	
	Communication	*Critical and innovative thinking, Inter-personal skills (e.g. presentation, organisation skills, etc.), IT skills including the*	
	To be able to work independently and in a team. Have the skills of oral and written communication.	*Analyze and evaluate the collected data. Use global information resources, a personal computer and basic user software package*	
	solving business problems	*critical thinking, reflecting on other presentations*	
Soft + Transversal + Technical skills (14 courses)	**Soft skills**	**Transversal skills**	**Technical skills**
	How to interact efficiently in a team, interaction of team members, time management	*Critical thinking, self-motivation and self-discipline*	*Protein purification and characterisation methods, data analysis techniques*
	Responsibility, Confidence and enthusiasm for learning, Team work, communication,	*Problem-solving, digital skills*	*Application of softwares*
	be able to account for methods for product development in the food sector	*be able to analyze and problematize the conditions and forms of creativity and innovation in different work-related contexts*	*be able to choose, use and evaluate methods used in product development*

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	they learn a lot in communication, exposing and writing	*project managment skill*	*they have to present a final project*
	Students learn to work together, to communicate inside their team and with the trainer, to think and solve problems/tasks.	*Students learn to organise, to keep records of their work. They acquire intra-personal skills.*	*Students develop a new product, taking into account the safety and hygiene problems. They have to develop a marketing strategy.*
	Communicating ; Thinking & Solving Problems	*Critical and innovative thinkin; Inter-personal skills (e.g. presentation, organisation skills, etc.); Intra-personal skills*	*Food Legislation; Food Safety Control*
	team work, team building, providing information for collegues, planning, organisation, adjustment, presentation	*combining different knowledge (of the master programme) to cope with a spezific task, to apply QM tools in practice*	*aquire practical competences in Lab accreditation, Auditing techniques, Food safety programmes, food production environment, etc*
	cooperation, feedback, communication, discussion, negotiation	*Critical and innovative thinking, planning, time management,*	*in areas of Food Legislation & Control and Food Safety Management + Food Hygiene & Food Safety Control.*
	communication, team work, problem solving	*report writing and presentation, project and time management, IT, Intra and Inter personal skills*	*Product development, food technology, food safety, consumer behaviour,*
	effective communication, flexibility	*lawyerly, communication, economic skills*	*comparative legal knowledge*
	Market and consumer elements of the course require a lot of soft skills (people to people), as does teamwork	*We combine Market and Consumer expertise with Food Technology elements for inter-, multi- and transdisciplinarity*	*Food Technology; Process Technology; Fermentation; Product development; Sensorics; Statistics; QA/QC etc etc*
Technical skills only (24 courses)	*basic knowledge about the principles and purposes of food processing, knowledge about the charakteristics of the resulting food*		

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	Product Development, Food Legislation & Control and Food Safety Management Food Hygiene & Food Safety Control.	
	They learn how to produce dairy products	
	Food analysis skills	
	The learners come to know about the chemistry of food components and their applications in food industry	
	About management and handing of harvested produce	
	calculation of food and biological value of food products, mastering of test methods for quality and safety	
	Methods analysis	
	The students receive knowledge in food safety, HACCP, standards (e.g. ISO 22 000), etc. which can be used in their practical wor	
	Product Development, Food Legislation & Control and Food Safety Management, Food Hygiene & Food Safety Control	
	designing nutritional epidemiological projets; designing nutrition educational materials	
	Solving large computations	
	programming, using optimization software	
	calculations with relation to food quality using mathematical approaches	
	Understanding role of food structure and processing methods to control and manipulate food structure.	
	epidemiology	
	Students need to understand what mechanisms/tools are used in food industry to maintain and improve food quality	
	product analysis and development	
	Planing healthy an comfortable Buildings	
Transversal + Technical skills (7 courses)	**Transversal skills**	**Technical skills**
	Critical and innovative thinking ; Accurate record keeping and report writing	*Food Legislation & Control and Food Safety Management; Food Hygiene & Food Safety Control.*
	thinking like an engineer and have industrial based approach to the problem	*lab ware manipulation and food quality control legislation*
	Inter-personal skills, time management, working in interdisciplinary groups	*Introduction to management, learning how to approach management frameworks*
	report writing	*food analysis (lab skills)*
	Innovative thinking, synthesis of knowledge, writing skills	*Data management, business process modelling, system architecture, IT security, etc*
Transversal skills only (3 courses)	*communication*	
	Combining nutrition biochemistry and food science. Working in multinational team	
	Students learn how to make connection among domestic animal behavior and welfare, physiology, pathophysiology, clinical setting	

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Annex 7: Assessment

Respondents were asked to identify the assessment method(s) used and could choose between:

- Multiple choice exam
- Open question exam
- Oral exam
- Written report
- Pitch competition
- Other

While the majority chose a mix of different assessment methods , the method “written report” and “open question exam” was chosen as the most often used method as indicated below:

Written report	43
Open question exam	38
Oral exam	27
Multiple choice exam	26
Pitch competition	4

Other:

- *coursework e.g. reports/videos/blogs*
- *Analisys of the impact of dissemination*
- *appropriate design and performance of facilitation*
- *Professional Product ("Beroepsproduct") with description; Video portfolio; Executive summary*
- *Structured question paper*
- *Both team and individual reports. Overall course contributions.*
- *a group work consisting in the presentation of a nutrition case study (fake news in the nutrition field) set with the teacher.*
- *Class presentation of individual projects*
- *Complete case study with minimum score*
- *Laboratory and Computer Practices*
- *No final assessment*
- *Oral presentation of the report*
- *plus individual level reflection report*
- *presentation of the outcomes of the groupworks*
- *Professional Product ("Beroepsproduct") with description; Video portfolio; Executive summary*
- *Structured question paper*
- *Team work and Oral presentation evaluation*

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Annex 8: Purposes for applying innovative teaching methods

To the question, "For which purposes are you applying an innovative teaching method?"(multiple choice), respondents could choose between the following possibilities:

- Testing performances on already existing module/course
- Improving performances of already existing module/course
- Suggestion by external parties (colleagues, literature)
- Experimenting the application after a specific training on innovative teaching tools
- Other, please specify:

The possibility "Improving performances of already existing module/course " was selected by the vast majority of respondents:

Improving performances of already existing module/course	44
Experimenting the application after a specific training on innovative teaching tools	25
Testing performances on already existing module/course	13
Suggestion by external parties (colleagues, literature)	11
Other, please specify: • *Interaction with industry in the Food Innovation Community Amsterdam* • *Professional qualification, to be best prepared for the career entry; improves the quality of the study programme* • *efficiency of teaching, evaluation* • *to manage large student groups (> 200)* • *Developing skills and abilities* • *The aim for interdisciplinary in this new course made these practices suited* • *Strange question: Because it was designed to be part of the course.* • *We had to design a course addressing soft, transversal and technical skills.* • *shear number of students (> 200) drives this innovation.* • *I am not applying an innovative teaching method but I would like to do it in the future* • *For the purpose of facilitating relevant learning of the subject matter*	

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Annex 8: 5 P's Model

1P: Purpose

To the question: "Is planning managed in a participatory way (involving or students or external stakeholders) or is it managed by the sole course-responsible?", respondents could choose between:

- Participatory way; or
- Solely managed by course-responsible

26 respondents chose "participatory way" and 41 chose "Solely managed by course-responsible"

To the question "Does planning of the module/course (mission, target, aims) responds to specific needs?", 10 responded "no" and 57 "yes".

Those 57 responding positively were asked in the following question to indicate which needs (multiple choice) from a selection of needs. The possibility "improvement of technical and knowledge competences" was chosen by the majority of respondents" :

Needs	**Number of respondents selected this possibility**
improvement of technical and knowledge competences	45
improvement of personal and transversal skills	32
request by the job market or company	20
general sector specific issues	15
Other, please specify: • *to improve the students' "learning to learn" abilities* • *interdisciplinary research skills*	

To the question," How often is the course (objectives, content) evaluated and/or re-designed?", respondents, respondents were asked to indicate:

Selection	**Number of respondents**
After every semester	17
Once a year	33
Once every two years	12
Other, please specify: • *every 3 years* • *it is continuously adjusted and kept up to date* • Reviewed annually at course level with a complete institutional review every 5 years • 2 N/A	

2P: Principles

To the question "Please identify the principles or philosophies that guided you/your institute/ when you designed this module/course", respondents gave the following replies:

an engineer should be able to communicate with ease and using any format

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active participation of student
preparing professionals for XXI century demands, people who learn to learn, who learn to work with others, who have new ideas, that have strong initiative.
Continue development, adaptation to the industry requirements
Contributes to the final learning outcomes
Industry needs, combine past competencies, exert creativity, implement projects from start to finish
connection with practice, employment
Train people able to analyse food and food products for consumption
Food chemistry and food analyses is a very important module for undergraduate students so as to search later for a job in the food industry a major sector for chemists in Greece.
Biggs' model of constructive alignment
The food companies are interested to get absolvents with knowledge in food safety and hygiene.
To think global and act local
Phenomenology. Student-centred learning. Student-active learning. Experiential learning.
problem based learning
New technologies, sustainable processing
none since I was not aware of this.
The development of "Personal Leadership" by the students is leading, they have to identify the gaps and talents that need to be addressed. They are challenged to start up a company or other setting in which they can win awards in (inter)national competitions, meanwhile enjoying flanking education in personalized combinations of modules. A [parallel 10EC project to work on an external assignment in multidisciplinary groups is also part the curriculum.
The dietitian must have a basic background on food safety
To enhance the dairy sector in the island which produce traditional products, a significant part of the dietary culture
to prepare our students best for their carrier entry - to be able to transfer specific knowledge to practice - to adopt specific konwledge to cope with a specific task
Principle of applicability, design of contents on the basis of usual questions to be answered in the professional field
Openness to new ideas and concepts *Creative but Strategic thinking* *Goal-oriented and result-driven*
The students need to know how to control the hazards and cross contamination in food premises.
Learning about real life organisations, by lecturing, excursions and small student projects.
The transition towards a circular economy is one of the biggest challenges to realize a more sustainable (biobased) society. This transition requires an interdisciplinary approach, combining technical, managerial, and environmental considerations. +2 guest teachers
excellence
flexibility (the ability to change the content of individual topics due to new scientific and technical information and the number of hours of auditorium); usefulness for future practical activities (skills of some technological calculations and laboratory activities).
relationship with the studied and the basis for interconnected future disciplines, accordance with modern knowledge and practices in the field of organization management systems, orientation on practical skills in the development of management systems documentation.
Docentiaz criteria (University of Basque Country have an scheme for training and education not only with classes - internal procedures)
New knowledge in the subject in the world and needs to transfer that knowledge to students
active learning, accountable talk

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Effective communication between ICT engineers and managers is key for innovation with ICT. Managers should have basic understanding of IT and related issues in order to be able to design feasible IT-driven innovation.
Ongoing learning, ethical and sustainable approach to management, learning through experience
providing knowledge about transfer phenomena needed in all food processes
When applying active methodologies tbe aim is to prepare students to be able to follow with their self formation/training once they leave the Faculty and start their professional life. *Another importabt objective is to promote live-long learning*
no idea? students need to learn the basic principles of food Chemistry and know how to analyse food components. *We are constantly working on improving the course, using new and innovative didactic ideas, both digital and non-digital*
Durf te leren (Do not be affraid to learn)
flipped classroom for individual learning paths, peer-to-peer learning, providing opportunity for practical experience
Integrate and apply theory as trained in previous courses, in an interdisciplinary course with focus on soft and transversal skills
TECHNICAL UNDERSTANDING OF INDUSTRIAL PACKAGING APPLICATIONS, FOCUSED ON CRITICAL THINKING AND WORKING ON PACKAGING ISSUES, INCREASING THE ANALYTICAL AND COMBINATORIAL CAPABILITIES OF THE STUDENTS ON REAL CASE STUDIES.
Principle is to design a course that allow students to understand behaviour of complex food products.
combine technical learning with more general hard and soft skills - implementing a mind-opening approach
Make training material to train learning outcomes at higher cognitive level
to meet the Dublin descriptors for teaching
Education in the field of food technology, based on scientific, basic and applied and development studies, aimed at creating new knowledge and ideas and at fostering critical thinking and creativity, and knowledge, as well as, innovation transfer towards industry.
Education in the field of food technology based on scientific, basic and applied and development studies, aimed at creating new knowledge and ideas and at fostering critical thinking and creativity, and knowledge, as well as, innovation transfer towards industry.
Knowing what knowledge & skills are required on this topic in food industry, we designed the course
Knowledge, innovation and outreach
Provide theoretical and real-world knowledge of the organisation and the economic outcomes of different agri-food networks, possibly valuable on the job market
Students must be able to make calculations for certain processes.
Learning goals, dealing with number of students
One institute philosophy I endorse is the tendency to divide the subject into smaller parts. *Other principles I follow are: (a) to assess knowledge and competences in many and different ways, (b) to encourage students' autonomy, (c) to develop cooperation between students, (d) to encourage active learning, (e) to give prompt feedback, (f) to emphasize timing on tasks.*
mission statement and industry relevance
I had no specification from the university, I followed the state of art on this topic and ways that participants could apply theoretical input
Add cross-cutting skills to scientists

To the question, “Do these guiding principles fit with an open-to-innovation teaching and educational framework? 10 respondents replied “no”, 54 replied “yes” and 3 gave no answer..

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3P: Processes

To the question" In this specific module/course organization which rules, procedures or systems did you use/are you using for the logistic implementation of the course (e.g. Dublin descriptors, certification rules, ISO criteria, internal/organisation procedures, etc.)", the following replies were given (open):

No reply	17
Internal procedure	30
Dublin descriptors	11
Other: • *National Food Administration, university rules for course development* • *Internal procedures and Iso17025 for some analytical laboratory work.* • *Mostly ISO criteria and also certification rule (e. g. IFS and BRC)* • *for real implementation in real life* • *We are a University of Applied Sciences, NVAO-accredited. Dublin descriptors are underlying the whole system of our competence oriented curriculum. A lot of problem base learning in project groups is implemented in different settings on two locations (Delft and Amsterdam) and two major network communities with industry (FICA and FIA) are involved.* • *Knowledge and understanding* ○ *Applying knowledge and understanding* ○ *Making judgements* ○ *Communication* ○ *applying knowledge and understanding, making judgements, communication of results and within the team*	

4P: People

Respondents were asked to describe the educational and professional background of the teacher, to which the following replies came out:

I am a professor with a teaching qualification.	Hold a master of science in food science and technology and a PhD in Dairy microbiology	university lecturers and post docs contributing to practicals within the field of knowledge	Qualified	(Associate) Professor Food Process Engineering
the teacher has not any particular educational background, but I use my professional background	Etc.			

To the question whether external experts are included in the course, 33 responded "no" and 34 responded "yes". The latter group was asked to answer "How are these experts selected?" to which the vast majority responded that experts were selected on the basis of their expertise in the field.

The following replies came out:

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depending on the specific task experts from the industries are asked for their support
Expertise, availability
By their expertise, usually people from industry and ministry of agriculture
Journalist, experts in social networks
In every case acording to the interest of the student. Different experts will guide the specific project they have to present at the end of the course
They offer tasks to be solved with students. In some situations, they offer expertise and materials.
contacts with work life, previous contacts in education, prominent in the industry
according to the challenges
Expert in the field of interdisciplinary learning and teaching; selected based on research in the field of interdisciplinary learning and teaching
Using our collective network
These are professionals with proper backgrounds; enthousiastic participants from industry that are active in our networks already
food safety experts from food control authorities, certification bodies or the food industry
They are usually coming from the real sector. The purpose it for students to hear what kind of skills they need for a certain job and to compare the level of their skills with the ones needed for a particular job.
guest lectures; evaluator in student competition
These are two leading experts from other universities, teaching similar disciplines: department review and individual
They are a teacher of a similar discipline (head of the department) of another university and the head (leading specialist) of the national institute for standardization
Partners from various projects on the topic
Through contacts during conferences and project collaborations
according to their background, sometimes from the food industry sector, sometimes from the food legislation sector
They are professional facilitators, with an international work field
on a personal relation basis
Good in their field and willing to participate
The main innovation tested is part of a research programme, which means that we have experts available for advice
Depending upon the experience and work in relevant area
Instructor acquaintances who are selected to provide expert knowledge on real-life issues and job-market opportunities
Based on standing within the sector and relevance of background
On the recommendation of the Network of teachers
By competence and personal network

To the question if “additional tutors included in the course?”, 26 replied “no”; 38 replied “yes” and 3 did not reply.

5P: Performance

To the question “Which tools do you use to evaluate the performances of your course?” (multiple answers), the following replies came out:

Tools	Number of respondents
None	1

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Quality evaluation questionnaires to the trainees/learners at the end of the module/course	56
Quality evaluation questionnaires to the trainees/learners after a certain time from the end of the module/course	18
Success rate of the final examination	40
Number of enrolled trainees/learners edition by edition (or year by year)	11
Other: • *Self evaluation of course by teachers* • *We will apply the innovative elements in a cross-over design for research purposes, allowing us to monitor its performance* • *The kind of project choose and the presentation* • *Open evaluation discussion at the end of the course, to get constructive feedback and innovative ideas for next year* • *the course is centrally evaluated*	

To the question "How do you use the results of the performance tools to improve/modify the module/course?", the following replies came out:

I change what can be changed, but if the students coment bad PCs, no one is interested (management)
I compare them with the colleagues and discuss further improvement on department level
as basis for continuous improvements/changes (to stay up-to-date) in content and didactics
Annually there is a meeting to improve or modify skill, competences and themes if the evaluation is not satisfactory
Depending on the comments relevant actions are performed
to find weaknesses in the organisation of the course *to improve the teaching concept and the impact of individual sections of the course*
The results are taken into consideration to improve those aspects that are ranked lower. Open comments are particularly helpful.
Change the content of lectures, individual assignments, exam tickets, as well as teaching methods.
knowing what are the weak points and work on them for better results
in evaluation meeting by the team set terms for next round, using formal info from student evaluation forms, and from feedback fro Education committee (O.C.)
I take into account students' opinions to adapt the course
For example to improve questions.
Based on the comments of students we improvd our lectures and practical work
by applying the students suggestions, when and where is possible
I change the form of presentation of educational material, topics and / or content of practical classes, the frequency of intermediate tests, the topics for independent work of students
meditation and subsequent planning/implementation
To update the course content and include the suggestions for effective delivery of course content for better learning experience.
Restructuring of the contents and the organisation of the participation by experts
Improving subject of power point presentation and including modern analytical methods to practical work at laboratory.
we modify course if needed according to obtained results and suggestions from students
to make me aware of the students' performances or difficulties about what subject and why

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the results are in indication of which part of the course could be improved. This is discussed with the teachers and tutors involved.
Implementing suggestions of students and correcting in accordane with their comments.
adapt weak parts
I apply in the next academic year.
Make changes where desirable and feasible
there is an internal system of evaluation within the University
Discuss the results and prepare improvement strategies
As mentioned, this is part of ongoing research, thereby monitoring performance closely to optimize the tool
used as part of the annual review process as well as for monitoring as the academic year progresses
I use it for evaluation of suitibility of topic and methods
I adjust methodologies and content of the course year by year
develop the course, facilitate for future students
PDCA and mirroring results with participants form the networks
The trainees take part at special training courses and/or conferences to get updated knowledge of food safety and hygiene.
Every year taking account of the students performance/interest, which is different. The questions discussed and the expert opinion plus the researcher papers are changed every year.
Meetings to improve the course
Impooving my lectures and giving more examples
by yearly analysis of results and questionary about items contains
Feedback is directly implemented in the yearly review of the course
any feedback is to be discussed at the end of the course to define jointly suitable measures for improvement
Internal analisys
I try to improve the module based on the comments of the students
mostly through open comments, not so much on quantitative evaluation criteria
CRITICAL UNDERSTANDING OF THE FEEDBACK ACCORDING TO CAPABILIITES FOR SUTISFYING THE NEEDS
improve if possible
results are used to make regular updates to the course content
read and take up good suggestions
changing course elements that have received low evaluation scores by students
Including the aspects that students suggested
Serious ideas are discussed in teaching teach on relevance and feasibility to include next year.
After discussion with the teaching team we may implement suggestions.

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