D 3.2

STUDY VISITS TO ASIA FOR ACADEMIC STAFF TRAINING

WP 3: ACADEMIC STAFF TRAINING AND PREPARATION FOR DELIVERY

foodi

ERASMUS+ CBHE

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of the European Union

Project Information

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Project full title:	MSc Course in Food Processing and Innovation
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Prepared by

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Position	
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Reviewed by

Name	FOODI Quality Assurance Team

Table of Contents

1 Introduction

According to the project deployment UNISA was in charge to guide, design and to produce the material related to the teaching modules of 1) Research & Investigative Processes, 2) Food Process Design, 3) Processing Effects on Structural & Functional Components of Foods, 4) Food Supply Chain, Traceability & Sustainability, 5) Food Packaging, 6) Halal Regulation & Certification.

During the study visit at the University of Salerno, the active learning approach was discussed among the partners, also with the support of the lecture given by prof. M. Barolo of the University of Padua (Italy) on the adoption of active learning techniques in University courses after the experience gained in Padua (Ghidoni et al., 2019).

The process of producing materials for training trainers was also in charge of UNISA. To this end, a working group was constituted at UNISA (Massimo Poletto, Donatella Albanese, Stefano Cardea, Francesco Donsì, Francesco Marra, Michele Miccio, Gianpiero Pataro). The working group established a procedural methodology aimed at matching source information coming from the Asian partners with thinking and developing work, aiming at generating suitable materials and agreeable products to be returned to the southeast Asian partners as beneficiaries. The procedure is schematized in Figure 1.

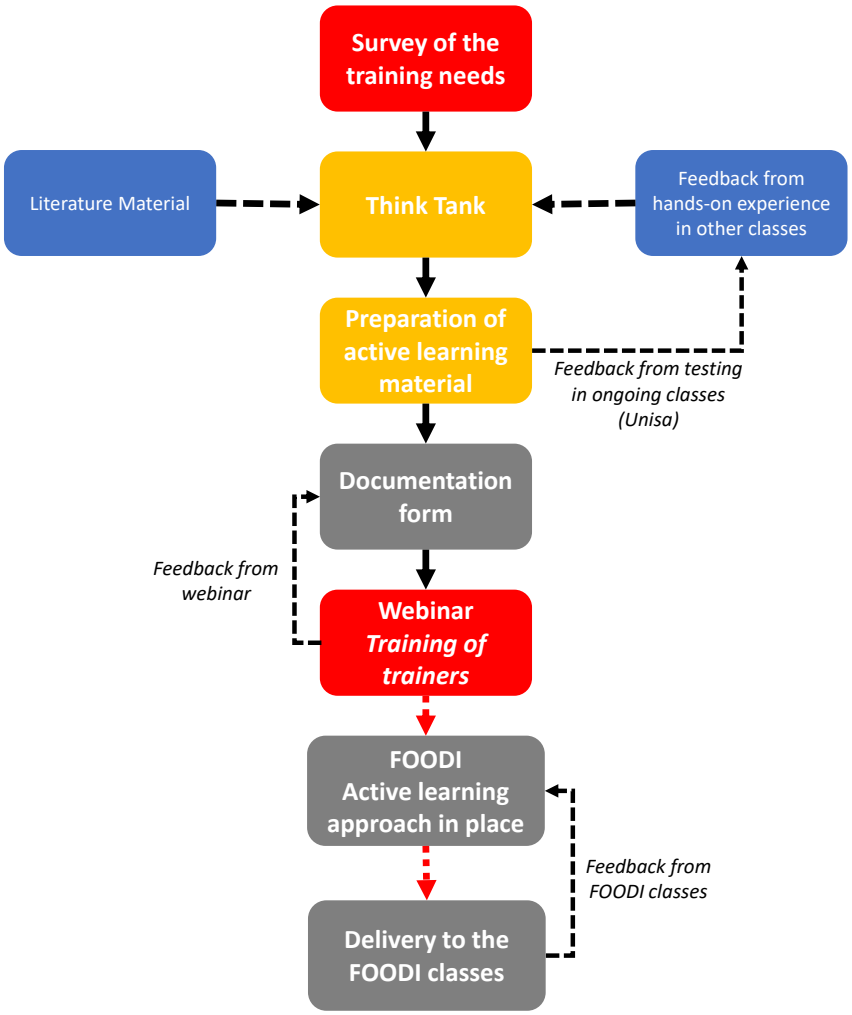

Figure 1 Block diagram of the procedure set up for producing and delivering active learning in FOODI.

2 Identification of needs

As a first step of such a procedural methodology, an initial survey was carried out by the working group at UNISA to identify the training needs of the Asian partners. The form developed for the survey is reported in *Appendix 1 Survey on training needs*.Appendix 1 Survey on training needs. The initial part of the form (question 1 to 6) gathers data of the responder (Name, institution etc.). In the second part (question 7) the responder is asked to specify the course for which he is answering (the responder may fill in the form more than once, each time for a different course. The third part (question 8) gathers the request of formation, by asking the responder to rank his own needs of formation among the following items:

- New Teaching material based on an "active learning" approach
- Programme of engaged/active learning activities for the courses
- Students training material (case studies, solved exercises, quizzes, etc.)
- Support materials for student learning (lecture notes, references, book extracts)
- Video lectures on course topics
- Extended syllabus with the indication of detailed course contents (reference for future teachers)
- Other

A final question (question 9) asks to specify "Other" if required.

The survey gathered 49 answers results are reported in *Appendix 1 Survey on training needs.*

The results of this survey revealed that most of the Asian partners were strongly interested in receiving formation and materials in "active learning". Therefore, it was decided that all three European institutions would have moved their focus and produced an effort in this direction, each institution with a particular attention to the courses assigned in the design step of the project.

3 Material production

As a second step, the UNISA team started a phase of internal thinking regarding the approach to be followed in order to set up the appropriate generation process of materials and examples of active learning, to be applied to specific lectures of the courses assigned to UNISA and the other Partners. The starting point was the literature data and the feedback from hands-on experience in other classes (both in presence and online). The Objective was to find a standardized procedure to register and communicate the design of active learning examples for the consortium-

4 A documentation tool

The outcome was the third step of Figure 1. And consisted in the development the active learning material, combining the literature material available mainly in the field of Engineering (Baeten et al., 2010; Daly et al., 2014; Felder and Brent, 2003; Mason et al., 2013; Prince and Felder, 2006; Wang and Tahir, 2020) with the hands-on experience developed in the classes taught by the volunteering lecturers of the University of Salerno. The process was further strengthened by the ongoing Covid-19 pandemics, which caused most of the University classes in spring and fall semesters of 2020 to be taught online. Therefore, the volunteers participating in the development of the active learning material had the chance to directly test the proposed approach in the difficult environment of the online classes, especially for what concerns student engagement.

As a matter of fact, one of the most critical issues deriving from the shift from in-presence to online teaching was avoiding to turn the lectures in Powerpoint shows and failing to provide variety in instruction (Felder and Brent, 2021). However, active learning in physically distanced classrooms still remains a formidable challenge (Bruff, 2020), which required considerable efforts in introducing novel tools, for example, for live polling (Wang and Tahir, 2020), collaborative notetaking and group work. Therefore, the most recent tools for online teaching were also revised.

The most important aspect in designing the active learning material, however, was considered to correctly identify the learning outcomes of the lecture and the teaching challenges, and based on those, to use the most adequate approach to pursue them. The most frequently identified teaching challenges, especially with reference to the topic of the lectures, were:

- Effective understanding of the concepts of the lecture;
- Ability to identify the main criteria used to select a specific food transformation process, also in comparison with conventional processes;
- Ability to evaluate the energy and mass flow rates involved in food processes;
- Ability to think critically and be able to select the appropriate non-thermal process for a particular manufacturing process;
- Enhancing the participation of the students during the lecture;
- Keeping the attention of audience high;
- Making audience aware of the critical review importance.

Six main types of the most common active learning modes were used, namely:

- Check of background knowledge;
- First approach to a new subject;
- Learn by doing;
- Assessment of learning;
- Assessment for learning;
- Development of a case study.

The process described in Figure 1 was documented through a dedicated form, set up after collecting inputs from the different partners and staff members and designed to describe the proposed activities to the instructors of the Asian partners in an orderly and effective way. *Appendix 2 Active learning documentation form* reports the form used, which consists of two main sections. The first section is dedicated to the description of the lecture intended as a module unit developing a whole topic. Each of the units was intended to last from one to a few hours. The objective of the section is to highlight the design approach in the adoption of specific learning activities. Therefore, beside the lecture contents, it includes the expected learning outcome of the lectures and the clearly identified challenges in the teaching process. The form also includes a summary of the kind of teaching approaches adopted to overcome or mitigate the difficulties foreseen for the teaching process. The second part of the form is in a tabular form and describes the active learning tasks, with as many tables as learning activities envisaged for the lecture under consideration. The table has to be filled by clarifying, first, in which part of the lecture the reported activity is placed, and then explaining its motivation by identifying the specific teaching challenges addressed, finally the kind of the learning activity adopted. Next, the strategy adopted to overcome the faced challenges is documented and, afterwards, the description of the

activity conceived is detailed. In the table it is also required to specify if the student involvement is individual or collaborative, if class and/or home student activity is required and if it is used for grading. The table also includes a space to add eventual references to the educational resources used.

5 The operating method

As a fourth step, the UNISA team decided to effectively develop materials for the assigned modules using a distributed, but cooperative approach. Hence, the task to produce a draft of the active learning activities for a given module was attributed to one or two staff members of the UNISA group. The whole group met in weekly meetings of 1 to 2 hours in which some activity proposals were cooperatively discussed and possibly amended. Sometimes the activity proposals were discussed twice in order to reach consensus. The work for such a step lasted a whole semester, during which a total of 54 proposed learning activities were developed in 84 lecture hours for 14 units in the 6 teaching modules. Some examples of "filled" form for active learning tasks linked to a given lecture is reported in *Appendix 2 Active learning documentation form*.

6 Training of trainers

The project had originally planned 3 staff visits to Cambodia, Thailand and Malaysia in spring-summer 2020, in which the visitors from the European Universities should have met representatives of the master course instructors in each of the countries to present the developed approach and the training materials. Due to the CoViD19 sanitary emergency, travelling was not possible. Therefore, as a fifth and final step, the presentation of the developed approach and of the training materials was switched to on-line webinars as commonly agreed within the consortium. The produced materials were organized according to the indication of ReadLab so that the teaching activity could be structured and reproduced as a MOOC. *Appendix 3 Material in support of MOOC at Readlab repository* provides an example of the MOOC structure and of the slides prepared for its delivery. Questionnaires to be provided to MOOC Attendees were also prepared and made available for implementation on the ReadLab platform. An example is provided in *Appendix 4 Example of multiple choice question* fors MOOC's.

The 6 one-hour interactive lectures were delivered on-line by the UNISA team between 03/08/2020 and 07/08/2020. During these lectures, examples of active learning applied to the assigned courses were provided. The interactive on-line webinars were attended by about 30 lecturers from the Asian partners (Cambodia, Thailand, and Malaysia), who actively participated and provided an individual assessment through a webinar appraisal form. The Asian attendants rated the webinars with an appreciation grade of 85% in the average, generally accepted the proposed approach toward active learning and positively evaluated the methodology transfer with an appreciation grade of 70% in the average. In addition, comments and other suggestions written in the webinar appraisal forms were collected by UNISA staff and used to further improve the active learning documentation supporting the Asian trainers.

7 Implementation of the training

The program of the FOODI Webinars that were conducted under D3.2, is the following:

Date- Time	Lecturer	Institution	Title of lecture
Aug 3, Monday, 08.30-10.00 (CET)	Prof. Francesco Donsì	UNISA	Active learning examples in

			Core 3 - Food Process Design (1)
Aug 3, Monday, 10.00-11.30 (CET)	Prof. Francesco Marra	UNISA	Active learning examples in Core 1 - Research & Investigative Processes
Aug 3, Monday 10.00-11.30 (CET),	Dr. Maria Salamoura	UAegean	Active Learning in Business Science
Aug 4, Tuesday 08.30-10.00 (CET)	Prof. Gianpiero Pataro	UNISA	Active learning examples in Core 3 - Food Process Design (2)
Aug 4, Tuesday, 10.00-11.30 (CET)	Dr. Ioannis Kinias	UAegean	Active Learning in Business Science
Aug 5, Wednesday, 08.30-10.00 (CET)	Dr Stefano Cardea	UNISA	Active learning examples in Elective_1_Food packaging
Aug 5, Wednesday, 10.00-11.30 (CET)	Dr. Maria Salamoura	UAegean	Active Learning in Business Science
Aug 6, Thursday, 08.30-10.00 (CET)	Prof. Donatella Albanese	UNISA	Active learning examples in Core 4 - Processing Effects on Structural Functional Components of Foods
Aug 6, Thursday, 10.00-11.30 (CET)	Dr. Ioannis Kinias	UAegean	Active Learning in Business Science
Aug 7, Friday, 8.30-10.00 (CET)	Prof. Michele Miccio	UNISA	Active learning examples in Core 7 - Food Supply Chain, Traceability, Sustainability

Aug 7, Friday, 10.00-11.30 (CET)	Dr. Ioannis Kinias	UAegean	Active Learning in Business Science
Aug 10, Monday, 8.30 - 10.00am Dublin Time	Dr Peter Dunne & Angela Brennan	UCD	Fostering Creativity & an Innovative Mindset
Aug 11, Tuesday, 8.30 - 10.00am Dublin Time	Dr Peter Dunne & Angela Brennan	UCD	Introduction to Design Thinking (Part 1)
Aug 12, Wednesday, 8.30 - 10.00am Dublin Time	Dr Peter Dunne & Angela Brennan	UCD	Design Thinking (Part 2)
Aug 13, Thursday, 8.30 - 10.00am Dublin Time	Dr Peter Dunne & Angela Brennan	UCD	Overview of the MIDAS Course
Aug 14, Friday, 8.30 - 10.00am Dublin Time	Dr Peter Dunne & Angela Brennan	UCD	Being an Entrepreneurial Educator

The EU HEIs (UNISA, UCD, UAegean) brought together a strong team of instructors with great expertise in their respective fields in order to deliver the online lectures.

Instructor's Profiles

Massimo Poletto

Title	**Professor of Chemical Engineering at the Department of Industrial Engineering of the University of Salerno (UNISA), Italy. Coordinator at UNISA for the FOODI project.**
Areas of expertise:	Lecturing for the courses of Powder Technology, Biochemical reactors and Environmental Chemical Engineering. Research interests in particle and powder technology.
Major works:	Presently involved in the quality assurance of education at the Department, University and National level. Past Chairman of the Degree Programme Board of Chemical and Food Engineering at UNISA. Guest Professor at East China University of Science and Technology (Shanghai). Member of the editorial board (Topic Coordinator of Particle Technology) of Chemical Engineering Reasearch and Design, the official publication of IChemE and of EFCE. Member and past Chairman of the Working party "Mechanics of Particulate Solids" of the European Federation of Chemical Engineering (EFCE)

Ioannis Kinias

Title	**Assistant Professor of Business Policy, in the Department of Business Administration of the University of the Aegean, and the Director of the Management, Entrepreneurship and Innovative Education Laboratory.**
Areas of expertise:	Business Policy and Strategy, Entrepreneurship and Family Business Management.
Major works:	Ioannis Kinias is Assistant Professor of Business Policy, in the Department of Business Administration of the University of the Aegean, and the Director of the Management, Entrepreneurship and Innovative Education Laboratory. He graduated from the Department of Mechanical Engineering in the Aristotle University of Thessaloniki (2002), holds a master's degree (MSc) in Engineering Management from the Brunel University (UK) (2004) and a Ph.D. in Business Strategy from the Department of Business Administration in the University of the Aegean (2012). He has also realized a Post-doctoral research (Post Doc) in Business Policy, in the Department of Business Administration, in the University of the Aegean, as a Research Fellow of the State Scholarships Foundation (2013-2015). He has taught at undergraduate and postgraduate level in the University of Central Greece (2013) as well as in the University of the Aegean (2013- now). His studies and articles have been published in various journals and presented in international conferences.

Frank Monahan

Title	**Dean of Agriculture and Head of the School of Agriculture and Food Science at University College Dublin.**
Areas of expertise:	BSc (Biochemistry); PhD (Food Science and Technology); Higher Diploma in Education; Graduate Diploma in University Teaching and Learning
Major works:	He holds a B.Sc (Biochemistry), Higher Diploma in Education and Graduate Diploma in University Teaching and Learning from University College Dublin and a PhD (Food Science and Technology) from University College Cork. Prior to joining UCD he was a postdoctoral scientist at the University of California, Davis and a visiting scholar at Michigan State University. His teaching is primarily in the area of Food Science, with research interests in food authentication, muscle fatty acids and antioxidants, and the impact of animal production systems (particularly animal diet) on the composition and sensory quality of meat and muscle foods. He has over 200 published peer reviewed papers and experience in leading/collaborating on national funded research projects under Irish Department of Agriculture Food and the Marine, Teagasc Walsh Scholarship and Science Foundation Ireland programmes and participating in EU programmes.

Angela Brennan

Title	**Research Assistant and Tutor, School of Agriculture & Food Science, University College Dublin (UCD), Ireland**
Areas of expertise:	Currently involved in research within the School of Agriculture & Food Science, University College Dublin (UCD) also an online tutor for the MSc Food, Nutrition and Health. Angela holds a BSc (Hons) Food & Human Nutrition from the University of Newcastle- upon-Tyne and has completed the Postgraduate course 'Creativity, Innovation and Entrepreneurship' with the UCD Innovation Academy'. Angela has over ten years' experience in the food industry, working in the area of new product development for Marks and Spencer, London, UK.

Stefano Cardea

Title	**Researcher in the Department of Industrial Engineering of University of Salerno. He is expert in supercritical fluids applications, in particular related to generation of micro and nanoporous polymers.**
Areas of expertise:	Supercritical fluids applications; membranes; foams; scaffolds; gels; fibers.

Francesco Donsì

Title	**Associate Professor at the University of Salerno**
Areas of expertise:	Nonthermal technologies, Nanometric delivery systems for functional foods, Mechanical cell disruption
Major works:	Francesco Donsì (orcid.org/0000-0002-6433-4486, https://docenti.unisa.it/005843/home) is Associate Professor in the Department of Industrial Engineering, University of Salerno (Italy) from 2015. Previously, he has been Marie Curie Visiting Professor at Unilever R&D Vlaardingen (The Netherlands) (2014-2015) and Assistant Professor in Chemical Engineering (from 2005) at the University of Salerno. He was also Visiting Scholar in the Department of Food Science, Rutgers University, NJ (US) in 2008 and Pre-doctoral Research Assistant at the Department of Chemical Engineering and Material Science, University of Minnesota, MN (US) in 2001-2002. He gained the Ph.D. title in Chemical Engineering at the University of Naples Federico II in 2003, in continuation with his education (master's degree in chemical engineering in the same University) and from 2003 to 2005 he obtained a scholarship at the Institute for Research on Combustion, CNR, (Italy) and a PostDoc position in the Department of Chemical Engineering, University of Naples Federico II (Italy). His research activities currently cover nonthermal technologies for food manufacturing, transformation and preservation, with a specific focus on high pressure homogenization, the nanoencapsulation of bioactive and natural antimicrobials in colloidal delivery systems, and the extraction of valuable compounds from biomass using physical cell disruption processes. He is author of more than 80 papers in indexed journals, with a h-index of 34(https://scholar.google.com/citations?user=nufhgoAAAAAJ&hl=it).

Francesco Marra

Title	**Francesco Marra (born in Cosenza - Italy, in 1974), is an associate professor of transport phenomena at the University of Salerno (Italy), expert in vitualization of processes in food engineering**
Areas of expertise:	Food engineering, energy transfer, mass transfer, mathematical modeling

Gianpiero Pataro

Title	**Associate Professor at the Department of Industrial Engineering, University of Salerno**
Areas of expertise:	Use of advanced thermal (e.g., ohmic heating) and non-thermal (e.g., pulsed electric field, pulsed and UV light) technologies in food and biotechnological applications

Peter Dunne

Title	**Researcher, FOODI Project at University College Dublin (UCD) in Dublin Ireland. Educator at Dundalk Institute of Technology in Dundalk, Ireland where I deliver the Food Biotechnology module in the Master's Degree in Agricultural Biotechnology.**
Areas of expertise:	Meat Science and Muscle Biochemistry; Beef Production; Human and Animal Nutrition; Food Science and Biotechnology; Retro-Innovations in Farming Systems
Major works:	Peter holds a PhD (2003) and a Bachelor of Agricultural Science (majoring in Food Science, 1999) from University College Dublin. His particular areas of expertise and interest are in Meat Science, meat production systems, human nutrition and retro-innovations in agriculture consistent with what is referred to as regenerative farming. Peter has worked for a decade with the Irish Agriculture and Food Development Authority (Teagasc), with the Agriculture and Horticulture Development Board in the UK and has extensive experience as a researcher and consultant in the private sector. He is a founding member of Regenerative Farming Ireland, a member of the Pasture-fed Livestock Association (Ireland chapter), a member of the Institute of Food Science and Technology of Ireland and Vice Chairperson of the Institute of Biology of Ireland. He is also a graduate of the Entrepreneurial Educator Programme in the UCD Innovation Academy where he earned a Certificate and Diploma as an Entrepreneurial Educator. He currently also teaches on the Masters Degree in Agricultural Biotechnology in his local Institute of Technology at Dundalk.

Donatella Albanese

Title	**Ph.D., Associate Professor of Food Science and Technology University of Salerno, Department of Industrial Engineering, Italy,**
Areas of expertise:	Shelf-life extension of food products Optimization and process innovation for the food industry; Development of Biosensors for food quality control.
Major works:	Donatella Albanese is an Associate professor at the University of Salerno, Department of Industrial Engineering. She has devoted her research field on the optimization and innovation of food technologies. Her research activities are focused on the shelf-life extension of food products and on the optimization and process innovation for the food industry. During the last years, she investigated the development of biosensors for monitoring and control of food quality. Prof Albanese is author of more than 100 scientific papers, 56 of them published in ISI/Scopus journals. Moreover, she is author of two international patents: Active packaging for the transportation of vegetable material -EP 2006218A3; Adsorbent for lengthening the shelf life of food products-EP 1530 998 A3. She was guest editor for the journal Biosensors, special issues “Biosensor and Bioanalytical Microtechniques in Environmental, Food & Clinical Analysis" and "Screen-Printed Electrodes and for the journal Sensors special issue “Smart Biosensing at BBMEC 12.

8 Conclusions

Examples of learning activities were developed to be applied to six modules of the master course “Food Processing and Innovation” within the frame of the FOODI project. Through a survey, the teaching/learning needs were preliminary collected to drive the approach towards active learning in the teaching process and to tailor its design. The work done was communicated to the users (i.e., the Asian partners of the project, future lecturers of the master course), using a specifically designed form. A constructive peer review process was adopted to verify the material produced and to homogenize its presentation. The examples of active learning tasks, constructively linked and effectively interacting with preselected lecture subjects, were presented in 6 web seminars in August 2020, within the frame of the FOODI project, to an audience of 30 experienced lecturers from Asian countries, who provided positive feedback in an individual webinar assessment form.

9 Appendix 1 Survey on training needs.

a. Survey form

18/07/22, 22:09 Survey on training needs

Survey on training needs

*Campo obbligatorio

1. Email *

FOODI PROJECT

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Co-funded by the Erasmus+ Programme of the European Union

Motivation
Dear Colleagues,

Those of you who were in Salerno may remember that the very last day there was a long discussion on what should be intended for the training material for the academic staff. This material, in fact, is the deliverable of WP3 of the Food project. During the meeting, it was clarified that the training of the Academic staff was included in the project because it was a necessary element for the project itself to be financed. Actually, a significant amount of the project resources for the European partners are dedicated to these activities. However, the use of these resources may be not optimal if the Academic training is dedicated to undesired objectives. So, in order to avoid this, it was decided that we would run a survey on the needs related to the academic staff training in the project, I am submitting you a survey in order to better define these needs and correctly focus the work of the European partners.

The survey is open to all Foodi participants but results will be analyzed both in terms of needs expressed per person or per institution or per course. Anonymous answers, or not reporting the institution will not be considered

Kind regards

Massimo Poletto

https://docs.google.com/forms/d/1gLyYGZfh2xoJ14RCQNVnS7vkdFKPPU87yY8PMy5POS4/edit 1/5

2. Your title

Contrassegna solo un ovale.

- ◯ Ms
- ◯ Mr
- ◯ Dr
- ◯ Prof
- ◯ Altro: _____

3. Your name *

_____

4. Your surname *

_____

5. Your Institution/Organization *

Contrassegna solo un ovale.

- ◯ Universiti Teknologi Malaysia
- ◯ University of Malaya
- ◯ Universiti Teknologi Mara
- ◯ Universiti Kuala Lumpur
- ◯ University of Heng Samrin Thbongkhmum
- ◯ University of Battambang
- ◯ Svay Rieng University
- ◯ Institute of Technology of Cambodia
- ◯ Ministry of Education Youth and Sport
- ◯ Asian Institute of Technology
- ◯ Prince of Songkla University

6. The nation of your Institution/Organization *

Contrassegna solo un ovale.

- ◯ Cambodia
- ◯ Malaysia
- ◯ Thailand

Please select the course you are involved

7. Course *

Contrassegna solo un ovale.

- ◯ FOODI Pre-req Food Science & Technology
- ◯ FOODI Core 1 Research & Investigative Processes
- ◯ FOODI Core 2 Food Quality & Sensory Science
- ◯ FOODI Core 3 Food Process Design
- ◯ FOODI Core 4 Processing Effects on Structural & Functional Components of Foods
- ◯ FOODI Core 5 Business Strategy & Policy
- ◯ FOODI Core 6 Food Safety, Law & Regulation
- ◯ FOODI Core 7 Food Supply Chain, Traceability & Sustainability
- ◯ FOODI Core 8 Midas Project
- ◯ FOODI Elective 1 Food Packaging
- ◯ FOODI Elective 2 Halal Regulation & Certification
- ◯ FOODI Elective 3 Food Sales & Marketing
- ◯ FOODI Elective 4 Nutrition & Health
- ◯ FOODI Elective 5 Entrepreneurship
- ◯ FOODI Elective 6 Consumer Behaviour

Please rank the need for you and your organization of the support material you need to deliver the selected FOODI course?
- 1: most important
- 7: less important
- not selected: not important

8. Ranking

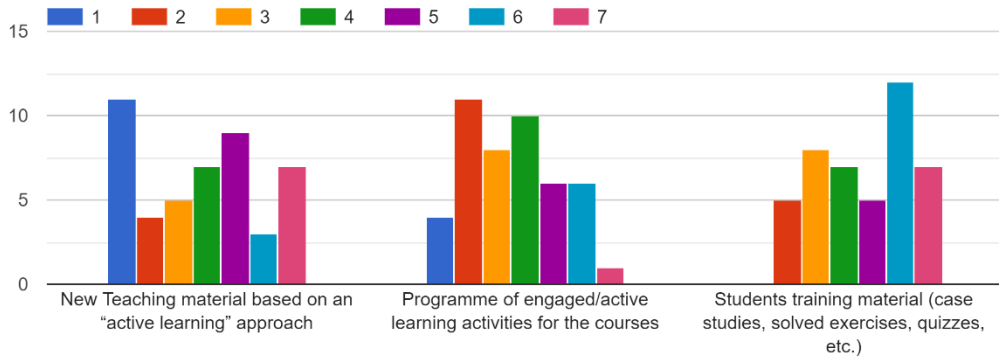
Contrassegna solo un ovale per riga.

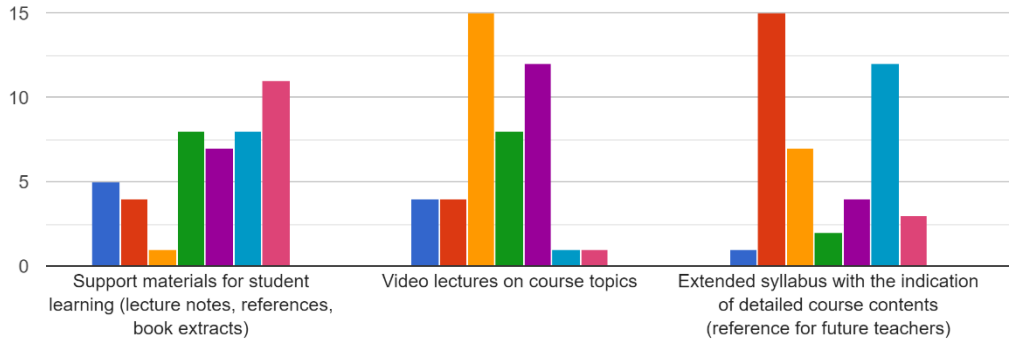
	1	2	3	4	5	6	7
New Teaching material based on an "active learning" approach	◯	◯	◯	◯	◯	◯	◯
Programme of engaged/active learning activities for the courses	◯	◯	◯	◯	◯	◯	◯
Students training material (case studies, solved exercises, quizzes, etc.)	◯	◯	◯	◯	◯	◯	◯
Support materials for student learning (lecture notes, references, book extracts)	◯	◯	◯	◯	◯	◯	◯
Video lectures on course topics	◯	◯	◯	◯	◯	◯	◯
Extended syllabus with the indication of detailed course contents (reference for future teachers)	◯	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯	◯

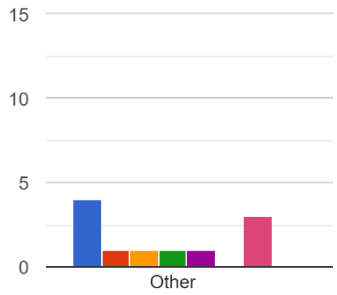
9. In case in the previous section you ranked "Other", please specify what:

b. Survey answers

Ranking

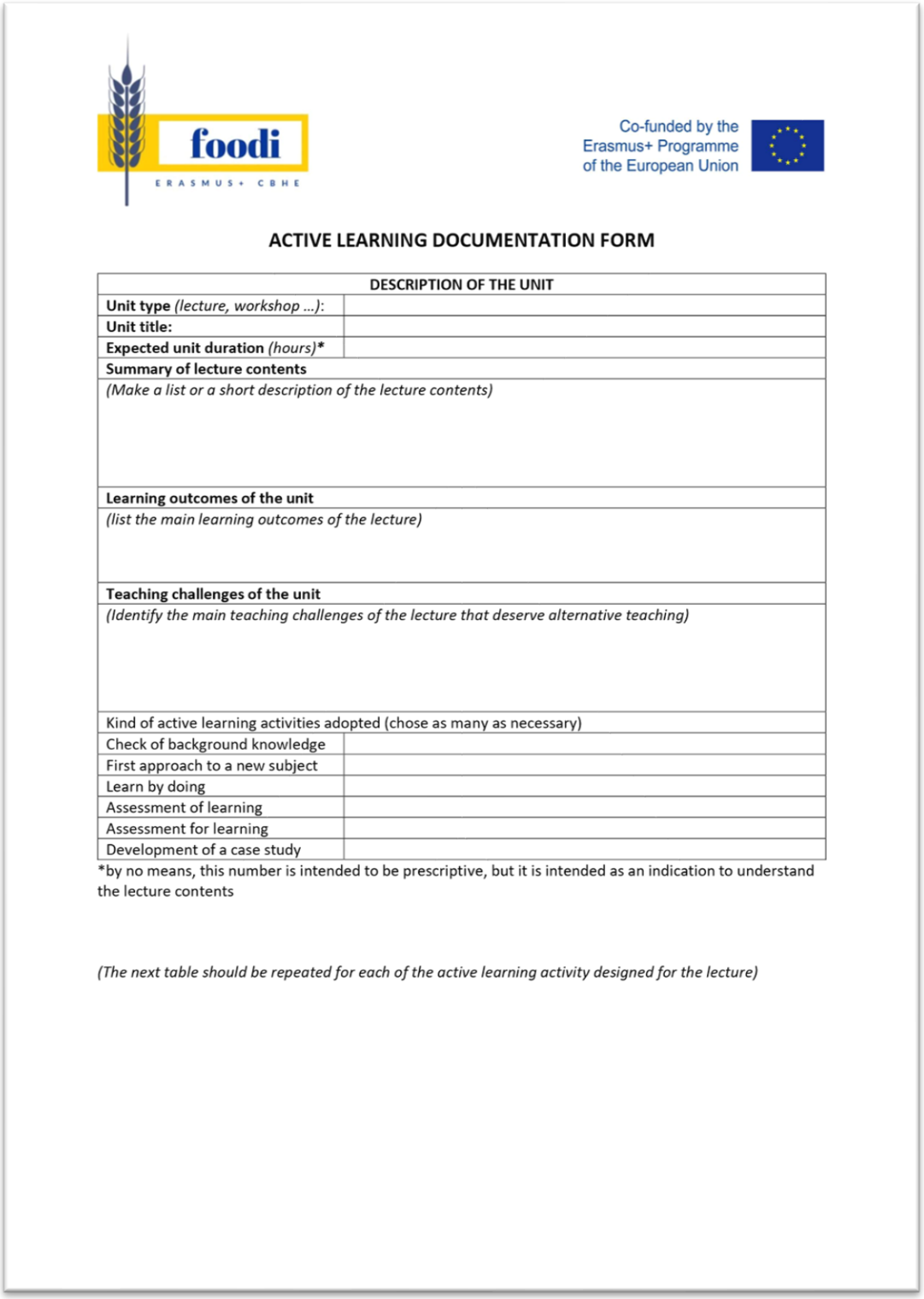






10 Appendix 2 Active learning documentation form

c. The empty form



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ACTIVE LEARNING DOCUMENTATION FORM

DESCRIPTION OF THE UNIT	
Unit type *(lecture, workshop …)*:	
Unit title:	
Expected unit duration *(hours)**	
Summary of lecture contents	
(Make a list or a short description of the lecture contents)	
Learning outcomes of the unit	
(list the main learning outcomes of the lecture)	
Teaching challenges of the unit	
(Identify the main teaching challenges of the lecture that deserve alternative teaching)	
Kind of active learning activities adopted (chose as many as necessary)	
Check of background knowledge	
First approach to a new subject	
Learn by doing	
Assessment of learning	
Assessment for learning	
Development of a case study	

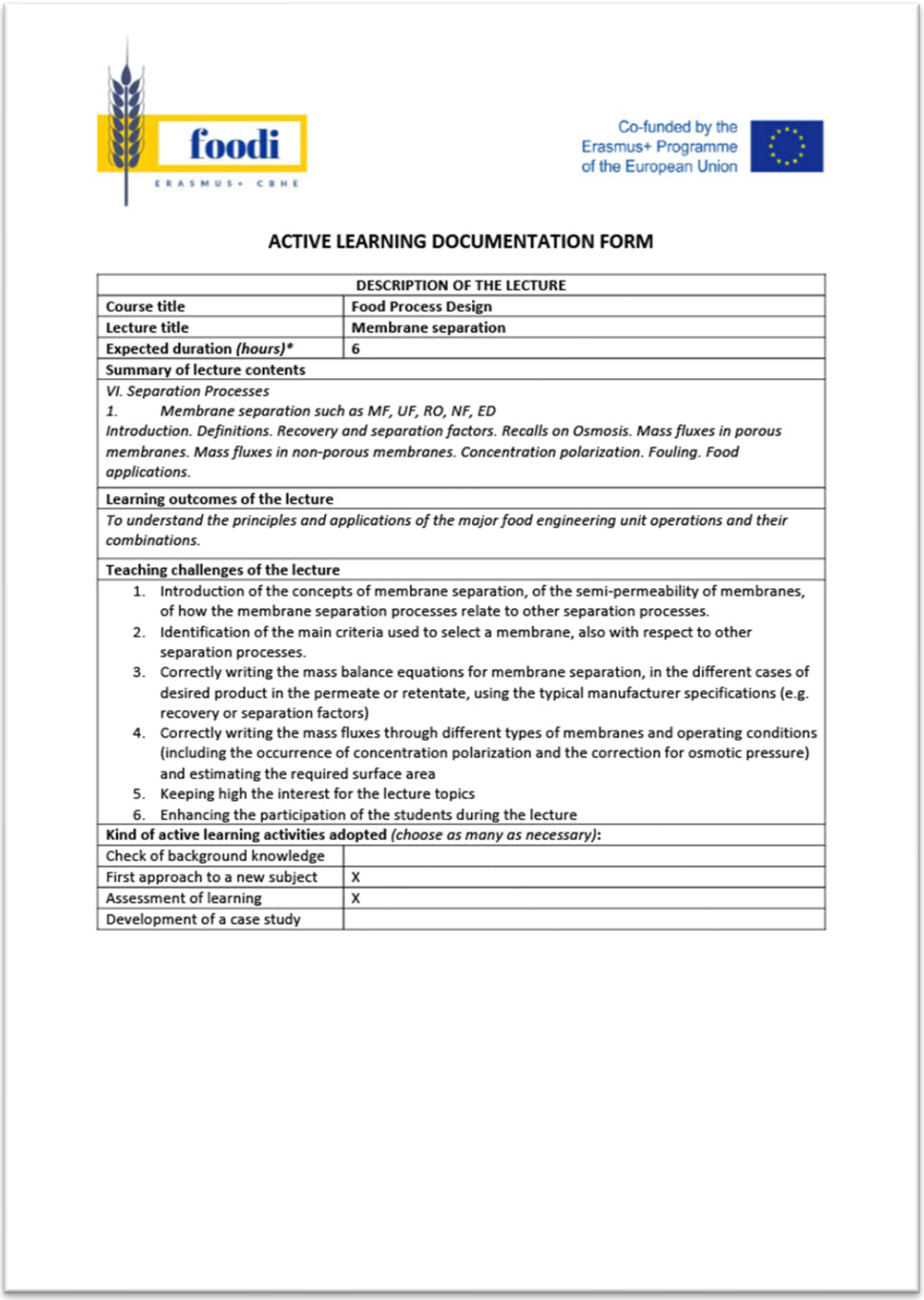
*by no means, this number is intended to be prescriptive, but it is intended as an indication to understand the lecture contents

(The next table should be repeated for each of the active learning activity designed for the lecture)

DESCRIPTION OF THE ACTIVE LEARNING ACTIVITY		
Number *(in time order)*:		
Expected duration of the activity *(minutes)*		
Collocation of the activity in the lecture:		
(Clarify the collocation of the activity in the lecture connecting it to the specific lecture content)		
Teaching challenges addressed:		
(Link the teaching activity with the specific teaching challenge(s) identified above)		
Kind of active learning activities adopted (choose at least one):		
Check of background knowledge		
First approach to a new subject		
Learn by doing		
Assessment of learning		
Assessment for learning		
Development of a case study		
Strategy:		
(Explain the strategy adopted to overcome the specific teaching challenge(s))		
Method (choose at least one):		
Involvement	Graded	Not graded
Individual home assignment		
Individual work in classroom		
Collaborative home assignment		
Collaborative work in classroom		
Description of the activity:		
(Describe the activity also using examples of material provided (tests, questions…)		
Attachments & links		
(List any material or link that can help the understanding of the activity)		

d. An example of filled form

The example form



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ACTIVE LEARNING DOCUMENTATION FORM

DESCRIPTION OF THE LECTURE	
Course title	**Food Process Design**
Lecture title	**Membrane separation**
Expected duration *(hours)**	**6**
Summary of lecture contents	
VI. Separation Processes *1. Membrane separation such as MF, UF, RO, NF, ED* *Introduction. Definitions. Recovery and separation factors. Recalls on Osmosis. Mass fluxes in porous membranes. Mass fluxes in non-porous membranes. Concentration polarization. Fouling. Food applications.*	
Learning outcomes of the lecture	
To understand the principles and applications of the major food engineering unit operations and their combinations.	
Teaching challenges of the lecture	
1. Introduction of the concepts of membrane separation, of the semi-permeability of membranes, of how the membrane separation processes relate to other separation processes. 2. Identification of the main criteria used to select a membrane, also with respect to other separation processes. 3. Correctly writing the mass balance equations for membrane separation, in the different cases of desired product in the permeate or retentate, using the typical manufacturer specifications (e.g. recovery or separation factors) 4. Correctly writing the mass fluxes through different types of membranes and operating conditions (including the occurrence of concentration polarization and the correction for osmotic pressure) and estimating the required surface area 5. Keeping high the interest for the lecture topics 6. Enhancing the participation of the students during the lecture	
Kind of active learning activities adopted *(choose as many as necessary)*:	
Check of background knowledge	
First approach to a new subject	X
Assessment of learning	X
Development of a case study	

DESCRIPTION OF THE ACTIVE LEARNING ACTIVITY		
Number *(in time order)*	1	
Expected duration of the activity ***(minutes)***	10 min	
Collocation of the activity		
The activity is collocated at the beginning of the lecture, before giving the introduction and definition of membrane separation processes.		
Teaching challenge addressed		
1. Introduction of the concepts of membrane separation, of the semi-permeability of membranes, of how the membrane separation processes relate to other separation processes. 5. Keeping high the interest for the lecture topics		
Kind of active learning activities adopted *(choose one)*		
Check of background knowledge		
First approach to a new subject	X	
Assessment of learning		
Development of a case study		
Strategy		
Discussion is stimulated among students about the criteria that should be applied to define a membrane, especially in comparison with filters, sieves and other barriers. This is done showing to the students different pictures, some of them provocative because they clearly do not depict a membrane, but which leads towards the concepts of semi-permeability and of the size of the objects, which are separated in membrane processes.		
Method *(chose one)*		
Involvement	Graded	Not graded
Individual home assignment		
Individual work in the classroom		
Collaborative home assignment		
Collaborative work in the classroom		X
Description of the activity:		
The students are shown some pictures and they are asked to discuss and in groups and tell if, what is represented in the picture can be defined as a membrane or not. They are also asked to provide a brief explanation of why they think it is or it is not a membrane. The discussion should take place with peers in groups, and continue until consensus is reached. Then, the corresponding form (provided in the activity section) should be filled.		
Attachments & links		
See attached pdf file (Food Process Design - Activity 1 - Is this a membrane).		

DESCRIPTION OF THE ACTIVE LEARNING ACTIVITY		
Number *(in time order)*	2	
Expected duration of the activity ***(minutes)***	20 min	
Collocation of the activity		
The activity is collocated immediately after giving the definition of membrane separation and introducing the main types of membranes and their technical features.		
Teaching challenge addressed		
2. Identification of the main criteria used to select a membrane, also with respect to other separation processes. 5. Keeping high the interest for the lecture topics		
Kind of active learning activities adopted *(choose one)*		
Check of background knowledge		
First approach to a new subject	X	
Assessment of learning		
Development of a case study		
Strategy		
Discussion is stimulated among students about the advantages and disadvantages of membrane separation. To each group a specific separation process is assigned to focus the panel discussion in comparison with other existing processes. The lecturer participates in the different panels, trying to give suggestion if needed and collecting new ideas. The answers, reported in a form for each application, are discussed during the lecture, and some of the topics of the rest of the lecture are anticipated to provide students with food for thoughts.		
Method *(chose one)*		
Involvement	Graded	Not graded
Individual home assignment		
Individual work in the classroom		
Collaborative home assignment		
Collaborative work in the classroom		X
Description of the activity:		
The students are asked to fill a table with the advantages (PROS) and disadvantages (CONS) of membrane separation in comparison with other separation processes. They are invited to work in groups, to discuss with peers, focusing on a specific application, which is assigned by the lecturer at the beginning of the activity (e.g. Waste water treatment, juice concentration, beer clarification, desalination, and whey protein recovery). Each student is asked to contribute to populate a PROS/CONS table for each application with an individual contribution, or voting for the terms already added to the table. Each filled table is then commented in the classroom.		
Attachments & links		
None.		

DESCRIPTION OF THE ACTIVE LEARNING ACTIVITY		
Number *(in time order)*	3	
Expected duration of the activity ***(minutes)***	30 min	
Collocation of the activity		
The activity is collocated after the introduction of the different types of membranes, the mass balances and the definition of the recovery and separation factors.		
Teaching challenge addressed		
3. Correctly writing the mass balance equations for membrane separation, in the different cases of desired product in the permeate or retentate, using the typical manufacturer specifications (e.g. recovery or separation factors) 6. Enhancing the participation of the students during the lecture		
Kind of active learning activities adopted *(choose one)*		
Check of background knowledge		
First approach to a new subject		
Assessment of learning	X	
Development of a case study		
Strategy		
Discussion is stimulated among the students about the strategies of solution of simple calculative problems about membrane separation processes. This gives the chance to the lecturer to verify that the mass balance equations are correctly written. The free text part of the answer is used to verify the analytical skills of the students, when facing problems formulated differently from what presented in the theoretical lecture.		
Method *(chose one)*		
Involvement	Graded	Not graded
Individual home assignment		
Individual work in the classroom		
Collaborative home assignment		
Collaborative work in the classroom		X
Description of the activity:		
The students are asked to discuss with peers in groups (formed by the lecturer) 3 simple problems about membrane separation, which include both calculative parts and a free text, paying attention to the units and the definitions given. They are specifically requested to reach consensus, before transferring the data to the answer form. The correct answers are then discussed with the classroom. ***Problem 1*** *An aqueous solution containing 3.0% w/w of solute is treated by RO. The permeate contains 150 ppm of solute.* *a) Determine the rejection factor and the enrichment factor.* *b) Explain which parameter seems to be more suitable* ***Problem 2*** *To enrich air in O_2, gas permeation is fairly used. At the permeate, a 75% of O_2 is observed.* *a) Determine the rejection factor and the enrichment factor for the N2.* *b) Explain which parameter seems to be more suitable* *Problem 3* *A membrane with a separation factor of $\alpha A,B = 10$ is to be used to separate a gas mixture of A and B. The feed flow rate is QF = 2000 cm3(STP)/s and its composition is XF,A = 0.413. The reject composition is to be XR,A = 0.30. Calculate:* *a) the permeate composition* *b) the fraction of feed permeated*		
Attachments & links		
None.		

DESCRIPTION OF THE ACTIVE LEARNING ACTIVITY		
Number *(in time order)*	4	
Expected duration of the activity ***(minutes)***	60 min in classroom	
Collocation of the activity		
The activity is collocated at the end of the lecture, after providing theoretical background on osmotic pressure, solvent and solute mass fluxes in membranes, concentration polarization, estimation of membrane surface area.		
Teaching challenge addressed		
4. Correctly writing the mass fluxes through different types of membranes and operating conditions (including the occurrence of concentration polarization and the correction for osmotic pressure) and estimating the required surface area 6. Enhancing the participation of the students during the lecture		
Kind of active learning activities adopted *(choose one)*		
Check of background knowledge		
First approach to a new subject		
Assessment of learning	X	
Development of a case study		
Strategy		
The students are asked to solve more advanced calculative problems about membrane separation processes, including the estimation of solvent and solute fluxes through the membranes and the estimation of membrane area. Active participation is stimulated through the creation of "specialized teams" on different topics, whose combination is necessary to solve the problems, and on the "flipped classroom concept". The students are encouraged to interact with each other and to rely on the competences of the other teams to quickly and efficiently reach the problem solution. In addition, they have also the responsibility of the specialization they are in charge of, which represents another driving force towards the sense of participation in the lecture.		
Method *(chose one)*		
Involvement	Graded	Not graded
Individual home assignment		
Individual work in the classroom		
Collaborative home assignment		
Collaborative work in the classroom		X
Description of the activity:		
In the previous lecture, 5 student groups are formed ("specialized teams") at to each of them the equations describing the following phenomena are assigned: 1) osmotic pressure, 2) solvent mass flux controlled by transmembrane pressure, 3) solvent mass flux controlled by concentration polarization, 4) solute flux controlled by concentration difference, 5) mass balances and compositions (including calculation of average composition in the feed side) and calculation of membrane surface area. They are asked to study thoroughly the topic they have been assigned to, to such a level to be able to write the correct equations describing the involved phenomena for different types of problems. The general solution of the problems is discussed in the classroom, with the specialized groups invited by the lecturer to intervene in the part of the problem solution of their competence. ***Problem 1*** *A cellulose acetate membrane shows a water permeability coefficient of $2 \cdot 10^{-5}$ g $cm^{-2}s^{-1}bar^{-1}$ and a NaCl permeability coefficient of $4 \cdot 10^{-6}$ cm s^{-1}. In a desalination experiment, the feed has 35 g L^{-1} of salt and 60 bar of pressure are applied.* *Calculate the fluxes for water and salt, the rejection and the salt concentration in the permeate.* ***Problem 2*** *Determine the flux rate expected in a tubular ultrafiltration system being used to concentrate milk.*		

The following conditions apply: density of milk = 1.03 g/cm^3, viscosity = 0.8 cP, diffusivity = 7·10^{-7} cm^2/s, bulk solute concentration c_B = 3.1% weight per unit volume. Diameter of the tube = 1.1 cm, length = 200 cm, number of tubes = 15, and fluid velocity = 1.5 m/s. *[assume a gel concentration of 22%]* ***Problem 3*** *An ultrafiltration system is being used to concentrate gelatin. The following data were obtained: a flux rate was 1630 L/m^2 per day at 5% solids by weight concentration, and a flux rate was 700 L/m^2 per day at 10 % solids by weight.* *Determine the concentration of the gel layer and the flux rate at 7 % solids.* ***Problem 4*** *An ultrafiltration system is being used to concentrate orange juice at 30°C (1.5 kg/s) from an initial solids content of 10 % to 35 % total solids.* *The ultrafiltration system contains six tubes with 1.5 cm diameter. The product properties include density of 1100 kg/m^3, viscosity of 1.3·10^{-3} Pa s, and solute diffusivity of 2·10^{-8} m^2/s.* *The concentration of solute at the membrane surface is 25 %.* *Estimate the length of ultrafiltration tubes required to achieve the desired concentration increase.*
Attachments & links
None.

An attachment – A questionaire for activity 1

Is this a membrane?

Please, look at the picture and answer to the question: "Is this a membrane?"

Abilita strumento di lettura immersiva

* Obbligatoria

1

Is this a membrane? * (1 punto)

- ◯ Maybe
- ◯ No
- ◯ Yes

2

Is this a membrane? * (1 punto)

- ◯ Yes

- ◯ No
- ◯ Maybe

3

Is this a membrane? * (1 punto)

- ◯ Yes
- ◯ No
- ◯ Maybe

4

Is this a membrane? * (1 punto)

- ◯ Yes
- ◯ No
- ◯ Maybe

5

Is this a membrane? * (1 punto)

- ◯ Yes
- ◯ No
- ◯ I don't know

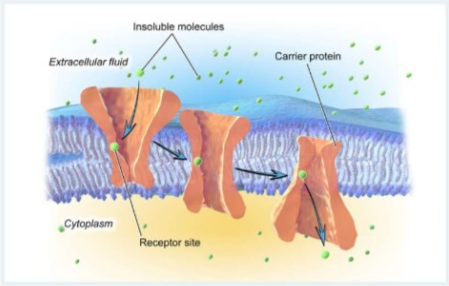
6

Is this a membrane? * (1 punto)

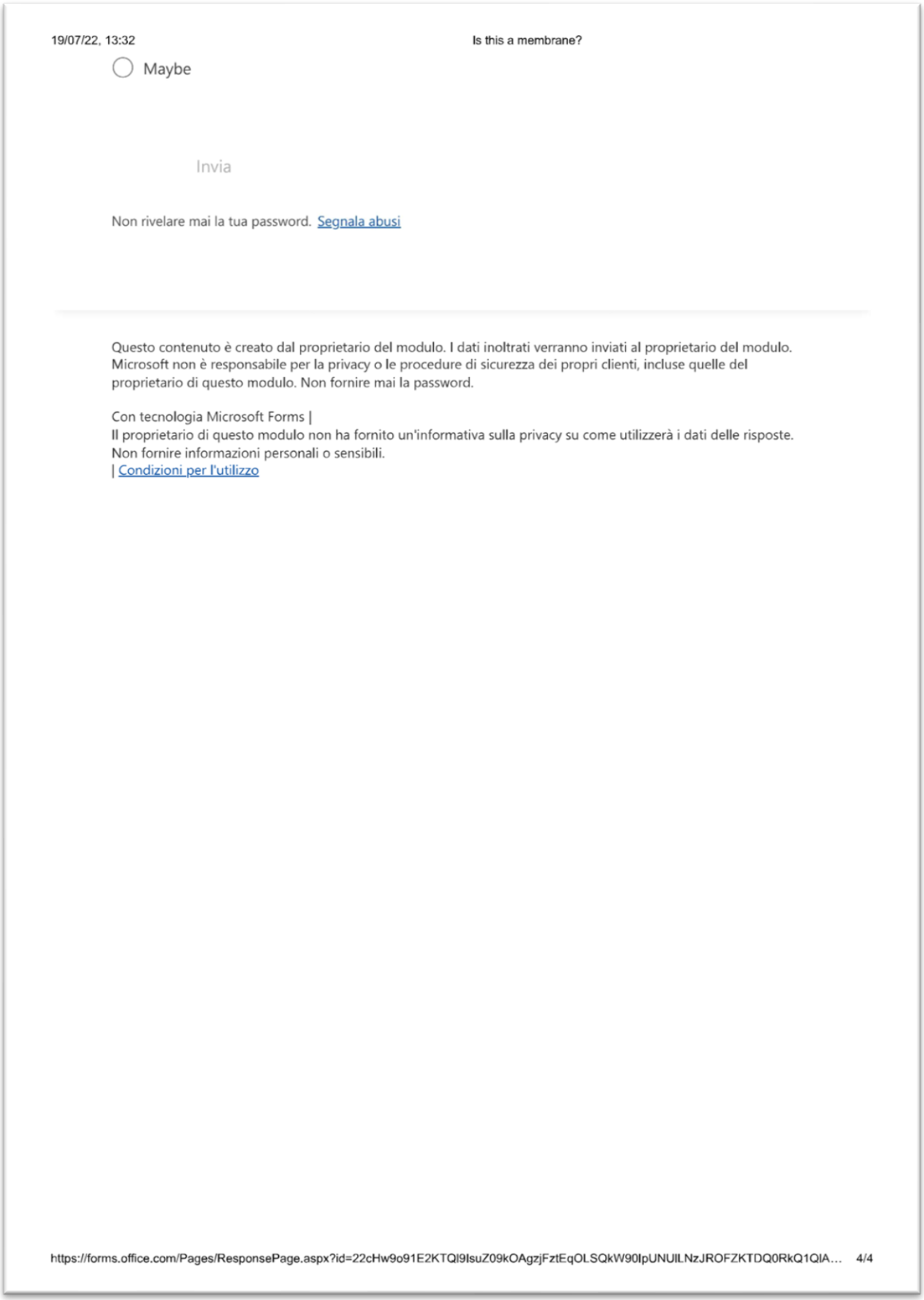
- ◯ Yes
- ◯ No
- ◯ Not sure

7

Is this a membrane? * (1 punto)



- ◯ Yes
- ◯ No

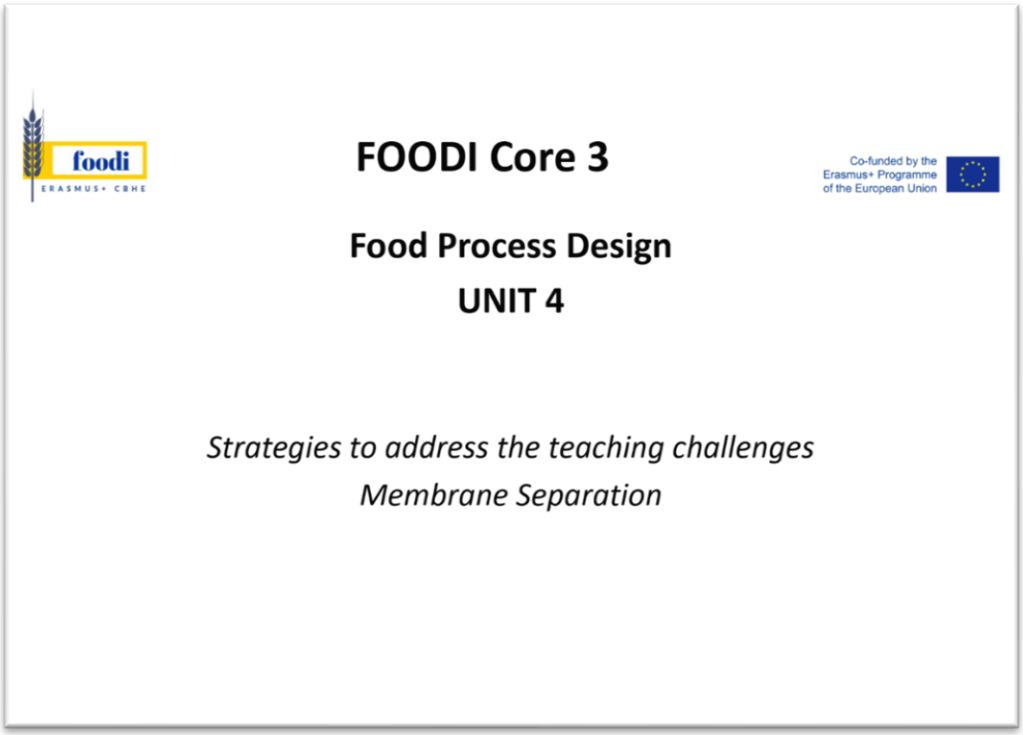


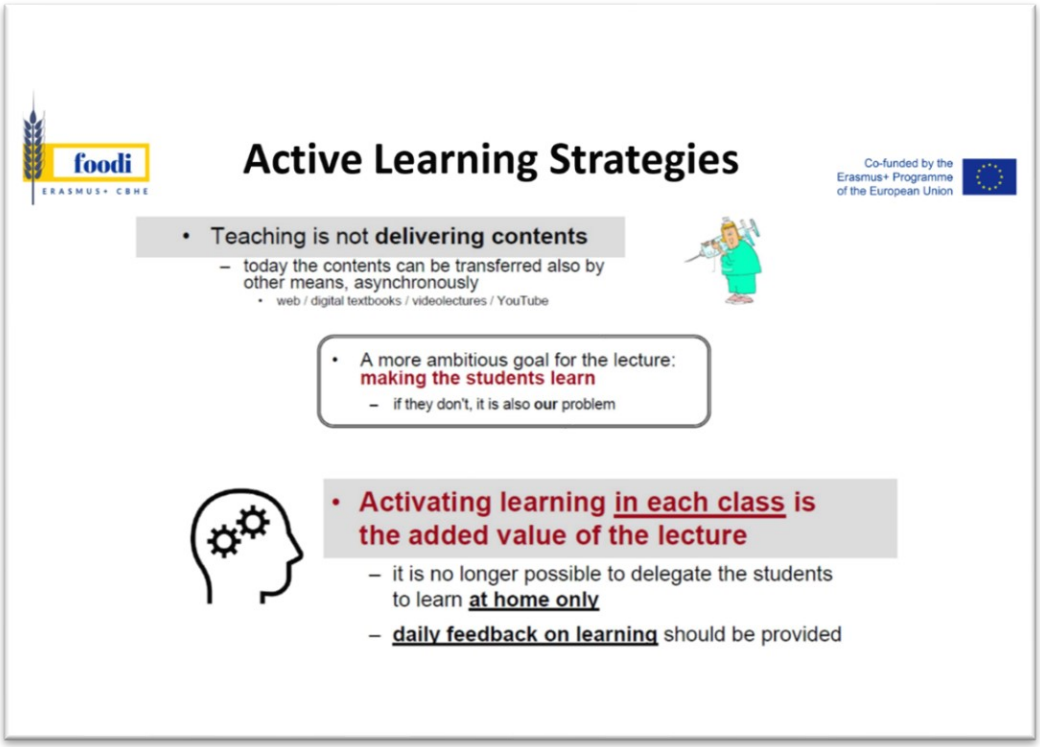
11 Appendix 3 Material in support of MOOC at Readlab repository

e. MOOC structure for Core 3 module - Food Process Design - 1

Building Blocks	Title	Description/Comments
Module ? (Section)	Examples for active learning in Food technology courses	
Lesson ? (Subsection)	**Active learning examples in Food Process Design (Core 3) course**	
Unit 1	Introduction to the Course	Power point
Unit 2	Introduction to lecture unit VI.18 "Membrane Separation" (learning outcomes)	Power point
Unit 3	Teaching challenges	Power point + PollEverywhere (discussion)
Unit 4	Strategies to address the teaching challenges	discussion: Guided association between hypothesized strategies and teaching challenge
Unit 5	1st Example of strategies and active learning activity	Power point
Unit 6	2nd Example of strategies and active learning activity	Power point
Unit 7	3rd Example of strategies and active learning activity	Power point
Unit 8	4th Example of strategies and active learning activity	Power point
Unit 9	Introduction to lecture unit VIII.23-30 "Nonthermal Processing" (learning outcomes)	Power point
Unit 10	Teaching challenges	Power point + PollEverywhere (discussion)
Unit 11	Strategies to address the teaching challenges	discussion: Guided association between hypothesized strategies and teaching challenge
Unit 12	1st Example of strategies and active learning activity	Power point
Unit 13	2nd Example of strategies and active learning activity	Power point

f. Example of slides in support (Unit 4)





Active Learning Strategies

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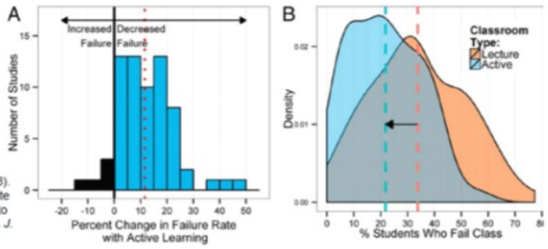
- **Student engagement** is central to the learning mechanisms
  - we can no longer ignore **how** learning occurs
  - content vs. context

- Learning **improves** with **active involvement**



Tharayil et al. (2018). Strategies to mitigate student resistance to active learning. *Int. J. STEM Ed.*, **5**, 7-21

Freeman et al. (2014). Active learning increases student performance in science, engineering, and mathematics. *PNAS* June 10, **111**(23), 8410-8415

Active Learning Strategies

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- Start of the new mood from **the very first class**
  - introduce youself
    - *Who am I? What has my career been so far? What is my expertise? Any hobbies?*
  - listen to the students
    - *What are their expectations from the course?*

- **Think-pair-share**
  - make the students work in the classroom on "small" tasks
  - in crowded classrooms: use *Kahoot* or *Mentimeter* to share the answers
  - assign short time (eg., 3–6 minutes), so as to keep them very active
  - variants
    - pair-think-share
    - mini flipped class: let them discuss in advance in groups a concept that will be taught immediately after

- **Flipped class**
  - students study at home, and the class is used to discuss/practice the content
  - record your lecture (*Kaltura*; *Camtasia*) and make it available to the students in advance
    - provide several learning assessment questions, and possibly some problems to solve

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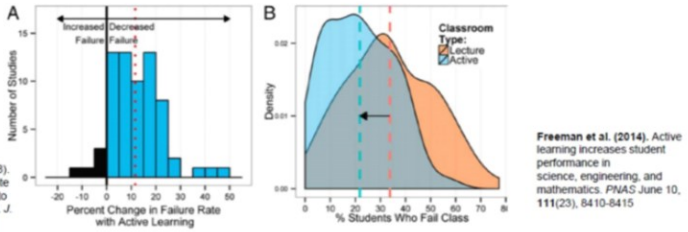

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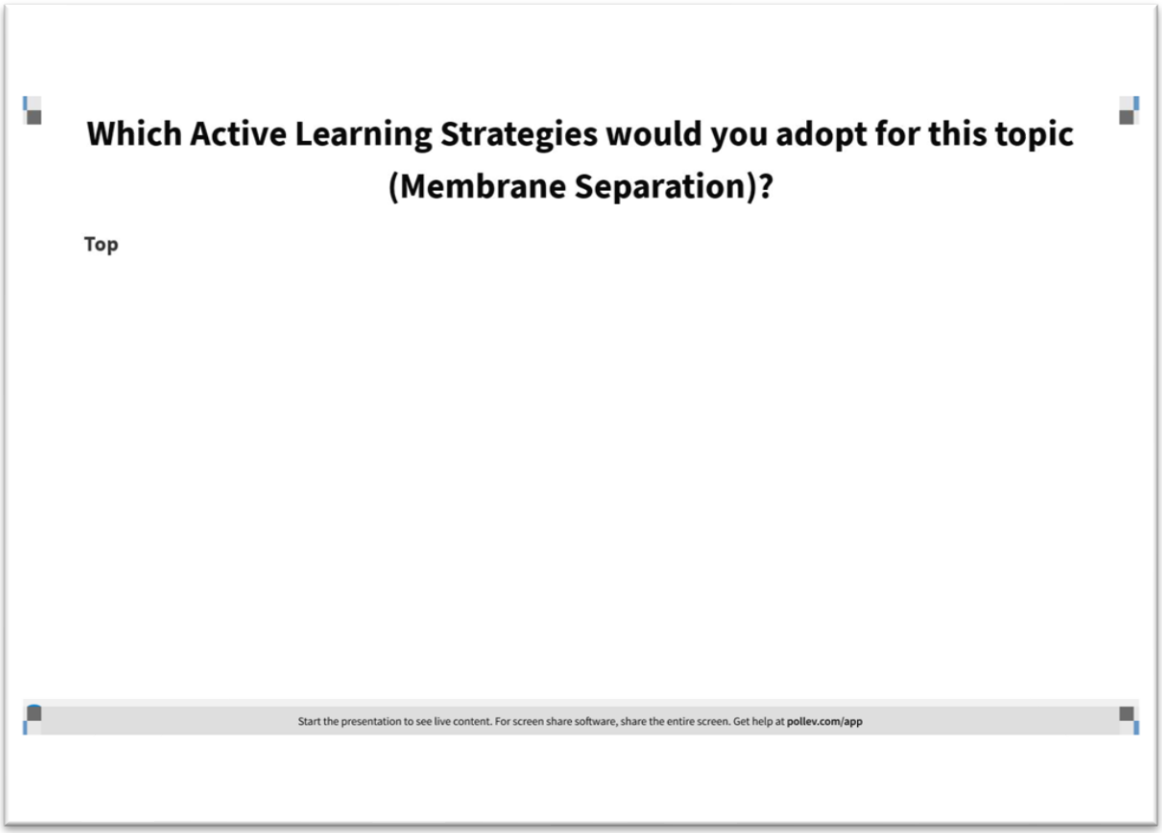
Which Active Learning Strategies would you adopt for this topic (Membrane Separation)?
Top
Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

12 Appendix 4 Example of multiple choice question fors MOOC's

Multiple Choice questions / FOODI Core 3 – Food Process Design

Question 1

Identify the category that best classifies the **first activity** described in the webinar for the Membrane Separation Unit.

[The students are shown some pictures and they are asked to discuss in groups if what is represented in the picture can be defined as a membrane or not (no introduction or definition on membranes have been provided yet).]

A. Assessment of learning
B. Flipped Class
C. Think-pair-share
D. Write the most important concepts you have learnt

Question 2

Identify the category that best classifies the **second activity** described in the webinar for the Membrane Separation Unit

[The students are asked to fill a table with the advantages (PROS) and disadvantages (CONS) of membrane separation in comparison with other separation processes. They are invited to work in groups, to discuss with peers, focusing on a specific application, which is assigned by the lecturer at the beginning of the activity]

A. Peer review
B. Flipped Class
C. Case study
D. Find the error

Question 3

Identify the category that best classifies the **third activity** described in the webinar for the Membrane Separation Unit

[The students are asked to discuss with peers in groups (formed by the lecturer) 3 simple problems about membrane separation, which include both calculative parts and a free text, paying attention to the units and the definitions given.]

A. Find the error
B. Peer review
C. Write the most important concepts you have learnt
D. Assessment of learning

Question 4

Identify the category that best classifies the **fourth activity** described in the webinar for the Membrane Separation Unit

[In the preceding lecture, students have been divided in 5 groups (specialized teams). Each group is asked to review the fundamental knowledge on specific topics. The general solution of the problems is discussed in the classroom, with the specialized groups invited by the lecturer to intervene in the part of the problem solution of their competence, when necessary and/or appropriate to keep the solution going.]

A. Flipped Class
B. Assessment of learning
C. Write the most important concepts you have learnt
D. Find the error

Question 5

Identify the category that best classifies the **first activity** described in the webinar for the Nonthermal Processing Unit

[The students are divided into as many groups as the nonthermal processes treated in the lecture. Each group asked to retrieve the relevant scientific information from reliable sources (preferentially from papers from indexed journals, and well-reputed books) to prepare a short presentation (15 min) to give to the rest of the class]

A. Assessment of learning
B. Write the most important concepts you have learnt
C. Find the error
D. Flipped Class

Question 6

Identify the category that best classifies the **second activity** described in the webinar for the Nonthermal Processing Unit

[The students are divided in the same groups formed for the preceding activity on the same topic (7 groups for the 7 different non-thermal technologies) and are asked to write a report, where the equipment design (sizing of the different parts needed for the treatment) and utility consumption are determined for the application of the nonthermal processes to specific case studies.]

A. Find the error
B. Flipped Class
C. Peer review
D. Think-pair-share