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Learning projects design guide for teachers

(WP2 - Deliverable 2.2)

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1. INTRODUCTION WP2 "CURRICULUM MODULES AND LLL CENTER PROGRAMS DEVELOPMENT": GENERAL DESCRIPTION AND OBJECTIVES

WP2 "Curriculum modules and LLL center programs development" includes the activities necessary for design and implementation of new master study curriculum and LLL programs on urban agriculture. The curriculum is two years study program with 120 ECTS with basic obligatory modules and closed list of elective modules to provide specialization. Study contents are organized in 5 modules: introduction to UA, food production systems, UA entrepreneurship, urban planning and resources, and use of technologies and ICT in UA. Modules meet objectives and priorities for each partner countries' needs based on results delivered in WP1. Needs analysis (see Deliverable 1.2) named communication a required soft skill for urban agriculture entrepreneurship and an issue to be covered in urban agriculture entrepreneurial education. Other soft skills considered important were creativity, time management, and flexibility. Considering hard skills, all subjects (plant production, machinery/engineering, marketing/trading, project planning, business planning, communication and networking, urbanity) are named by more than 40% of the surveyed people to be of value for UA entrepreneurial education. About two thirds named plant production (68%) and project planning (65%) followed by marketing / trading (53%), urbanity (51%), communication/networking (50%), and business planning, administration and finances (50%). Also specific training needs among these topics were investigated. Crop protection, plant nutrition and cultivation practices were the most required skills in the topic of plant production. Irrigation, greenhouse technology and precision agriculture were the most required skills in the topic of machinery/engineering. Quality management and customer relations were the most required skills in the topic of marketing/trading. Business, project planning and project management were the most required skills in the topic of business, administration and finances. Urban economy and urban planning were the most required skills in the topic of urbanity.

Within WP2 modules and modes (basic or advanced), objectives and learning outcomes for master study and LLL program are defined through the development of a curriculum draft (Deliverable 2.1). Modules 2, 3, 4 and 5 is offered in two modes: basic and advanced. Basic mode provides more theoretical education, while advanced is based on Problem Based Learning system (PBL) and Experiential Learning (EL). Thanks to a specific guide (Deliverable 2.2), a methodology for PBL and EL with regard to defined learning outcomes and competencies is established. A guide for students' skills and competence evaluations is created to define and describe a competence inventory and link it to the skills (Deliverable 2.3). This reference system is the core instrument both for planning and for the validation of the competence oriented learning. Module Placement Guide (Deliverable 2.5) assess student's current readiness to register for advance mode courses within the modules. This is necessary due to the interdisciplinary nature of new curriculum. Since module advance mode is based on PBL and EL, students are expected to have theoretical knowledge regarding field of the study prior to the course registration. Diploma supplement providing a standardized description of the nature, level, context, content and status of the studies is created for partner HEIs (Deliverable 2.6). Besides standard context, a special part includes descriptions of acquired competencies according to the EUROPASS cluster: social and

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organizational competences described in the field of study. A multilateral inter-institutional agreement (Deliverable 2.7) ensures credit mobility, virtual and physical students and staff mobility between the partner HEIs.

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2. ABOUT THIS DOCUMENT

Deliverable 2.2 “Learning projects design guide for teachers” is a guide that aims to a) describe Active learning - in particular problem based learning and experiential learning methodologies, b) explain how to design and manage Active learning and how to evaluate students and c) provide examples of activities that can used to assess Active learning.
This guide assures applicability of PBL and EL for each module of the curriculum developed within Deliverable 2.1. This guide will enable teaching staff to implement new/different PBL and EL scenarios with the possibility make students actively participate in course design and build in assessment criteria and methods from the design stage on.

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3 EDUCATIONAL METHODOLOGIES: ACTIVE LEARNING

Active learning methodologies like PBL (practice-based learning) and EL (Experience learning) go beyond the traditional view of learning. In PBL and EL learning is **not what we know in a particular subject or how much we know of it, but what we do with it.**
Active learning is getting more and more popular also in Higher Education. In Scandinavia, universities (1) started including Active learning activities in the design of the University curriculum according to four categories of active study. These four categories are concrete examples of implementing active – interactive -learning strategies.

CATEGORY 1:
Participation of lecturers and students – initiated by lecturer
Skills lab
Inclusive lecturing
Student guidance and study groups
Communication labs
Innovation camps
Exams and tests
Team presentations
Feedback on assignments and efforts
Proposals for assignment exercises and learning processes
Involvement in research and development projects
Cooperative learning
Project cooperation with professions/trades

CATEGORY 2:
Participation of students – initiated by lecturer
Study assignments
Study group work
Study techniques
Peer learning
Blended learning, flipped classroom
Project work
Internship periods
Observations
Clinical/practical tuition
Study visits to the profession/trade
Logs/portfolio

CATEGORY 3:
Participation of students – initiated by students
Peer learning

[1] University College of Northern Denmark

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Study groups and joint preparation
Independent studies
Independent assignment work
Interdisciplinary student relations
Exam preparation
Preparation of study products

CATEGORY 4:
Participation of lecturers and students – partly initiated by students
Presentation of study products and processes
Discussion events
Evaluation of tuition forms and own learning
Theme days
Dialogue forums

Assessment

When using Active Learning (AL) strategies, it is important to identify, from the very beginning how to assess students' learning.

What does assessment look like in Active Learning (AL)?

Determining what content knowledge and general capabilities you want to assess in the project-Active learning, such as critical thinking, collaboration and problem solving.

There are a number of opportunities for (assessment for, as and of learning) in AL and the giving and receiving of feedback and feed-forward to students throughout the project part of the AL process. Self-assessment and peer assessment form are an integral part of the AL experience. Further, celebrating events and presentations of learning can be used as summative measures of student performance.

How and when should we apply assessment strategies in AL?

Assessment should be an ongoing practice when implementing AL. Assessment does not always need to be formalized. Here assessment can be conversational (discussion) or through reflection; however, all assessment should be done in the spirit of tracking students' progress and achievements. In the following two sections (3.1 and 3.2) we will present practices for both PB and EL.

3.1 Problem based learning (PBL): general information and history

Problem-based learning (PBL) approach is a teaching methodology that is said to provide students with the appropriate knowledge to solve problems. Learning in a problem-based curriculum starts with a problem. A problem usually describes some phenomena or events that can be observed in everyday life, but it can also consist in describing a topic. A problem, written by a group of teachers, is intended to guide students towards certain important theoretical or practical subjects of study (Schmidt, 1983).

This approach refers to an instructional strategy where an individual or group make decisions or go through a series of steps in order to arrive at answers to questions or the solution to a problem (Saskatchewan Education, 1994). It is noted that in the process of solving one problem, the learner may discover other problems leading them to jump back and forth between steps (Newcomb,

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McCracken, & Warmbod, 1993). This interactive process allows students to become active learners, and as a result of their participatory education, develop career and academic skills that aid them in becoming productive contributors to society (Ellibee, 1990).

Problem-based learning (PBL) is a teaching strategy first developed in the medical education field (Barrows & Tamblyn, 1980) to help students develop both content knowledge and the clinical reasoning skills needed by medical professionals.

This educational methodology was born in the 1960s, when at McMaster University in Canada, Howard Barrows and his research group found it difficult for students to apply the scientific notions they had learned to situations of clinical practice. Therefore, they began to set up courses in medicine by simulating clinical cases, in the belief that starting from concrete cases, students would learn the disciplinary content (Barrows and Tamblyn, 1980). Subsequently, the method was introduced in other Faculties of Medicine: University of New Mexico in the United States, University of New Castle in Australia, University of Suez in Egypt, University of Harvard in the USA, University of Maastricht in the Netherlands. From the Faculty of Medicine, gradually, this methodology has been applied within the university courses for the training of health personnel, dentists, veterinarians, school leaders, engineers and finally in secondary and primary schools.

3.1.1 PBL theoretical basis

The PBL approach conducted by a tutor who asks questions has a long history: it was used by Socrates in 400 BC who asked questions to his students and his interlocutors, as in the famous dialogue "Menone", reported by Plato. In this text, we read that the great Athenian philosopher, questioning a slave and using the inductive method, comes to discover the theorem of Pythagoras.

On the other hand, reaching our days and analysing the new theoretical framework of "constructivism", the hypothesis emerges that problem-based learning is a didactic model that could be among those born in this context. The constructivist approach goes beyond the previous behavioural and cognitivist paradigms, centred on the role of the teacher as a transmitter of knowledge through a sequential-curricular path of acquisition and processing of information, "objectively" verifiable.

In this context "*learning is a process of building new knowledge on the basis of previous knowledge, influenced by metacognition, and takes place in situated and social contexts*" (Lotti, 2007). Consequently, the didactic models born from constructivism can be traced back to some methodologies that put students in a position where they can co-construct knowledge starting from the awareness that their knowledge is inadequate or questioned by scientific comparison with equals.

Constructivist teaching must be characterized by the construction and not by the reproduction of knowledge, a construction inevitably characterized by the student's prevailing cognitive style and type of intelligence (Gardner, 1994). A didactics that should not simplify but make visible the complexity of reality and its representations, developing learning situations based on concrete cases. A path reinforced and requalified by processes of collaborative learning and by reflective and metacognitive attentions.

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3.1.2 Characteristics of the PBL methodology

The PBL has very specific characteristics that differentiate it from case studies, heuristic lessons and co-operative learning: the role of the teacher and tutor, the problem, the procedure of 10 steps, the small group and a specific training setting.

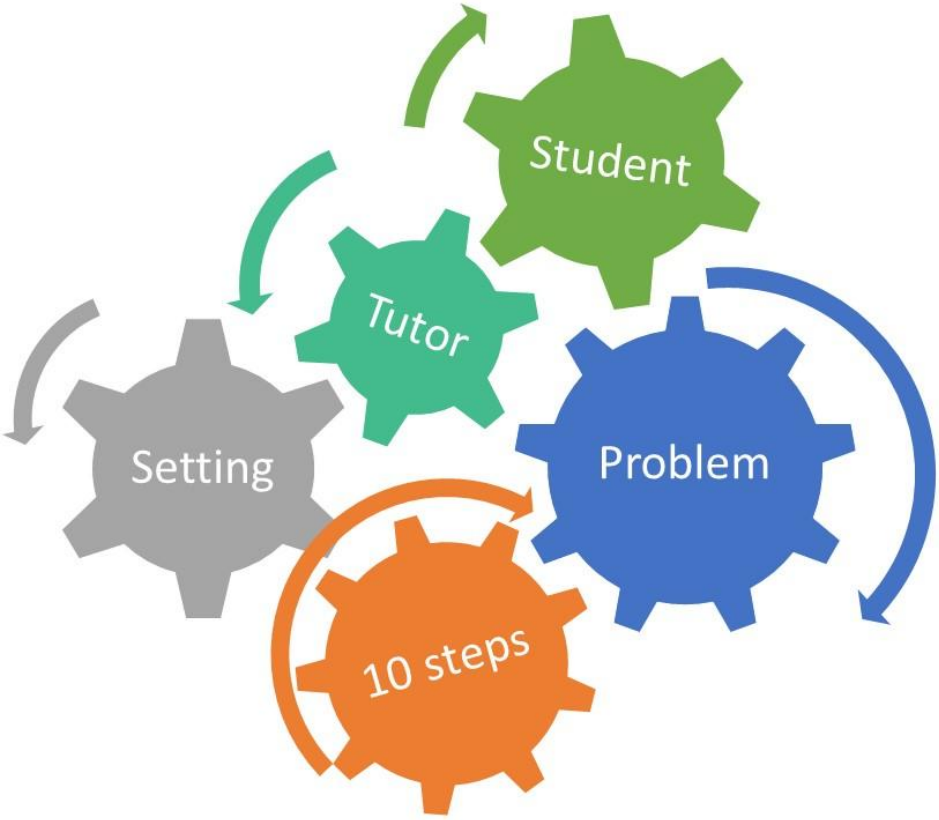

Figure 1. The five key elements of PBL methodology.

The tutor role.

The role of the teacher is no longer that of a transmitter of knowledge but of a facilitator of learning. He essentially performs 4 functions:

1) The metacognitive tutor of the group.

The tutor is the one who leads the group of students for the duration of the module or teaching block. He supervises the Seven Steps process by asking special questions and plays a meta-cognitive role, asks the students to explain aloud the cognitive processes they are processing and is concerned about the proper functioning of the group. Research is underway to assess the differences in student learning by varying the conduct with expert or non-expert tutors of content, teacher or senior student.

2) The module planner.

The professor participates in the planning groups of the teaching modules by setting the essential objectives of his discipline for the achievement of the objectives of the module.

It contributes to the construction or choice of problems to be submitted to students, communicates the list of bibliographic resources necessary for the independent study of students so that they are available in the library or on sites. It contributes to the planning and management

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of educational workshops connected with specific objectives, usually practical or relational, to be implemented in an integrated way starting from the problem.

3) The evaluator.

The professor helps to prepare the end of module assessment tests for an objective evaluation of the students.

4) The expert in disciplinary content.

The professor gives some lectures on key topics in the Module and participates in clarification meetings with students when, at the end of the discussion of the second meeting, they need further clarification. In this way, the teacher will be able to answer questions asked by prepared and motivated students.

So to sum up, the tutor:

- must be a promoter of meetings and discussion in the group;
- must be able to identify issues on which there is no agreement between the members of the group, unresolved issues, aspects on which no decision has been taken, undefined practical issues;
- must be able to involve all the students of the group in discussions, exhibitions and operational decisions;
- must introduce moments of crisis or elements that favour the creativity of the group, to lift from monotony and find original ways to personal learning;
- must call for respect for the rules of the PBL and an adequate use of study time, so that the pace of learning is not lost;
- must know the sources from which to draw the necessary information to study the case and the places where they are available (libraries, internet point of the faculty, etc.);
- must be open to any kind of cultural solicitation and does not tend to exclude certain preconceived themes or personal convictions (e.g. on issues of ethics) or to impose its own moral position and/or experience (e.g. on issues of professional morals).

The problem.

It is the starting point of the learning process.

The problem is usually a neutral description of an event or set of phenomena that need to be explained in terms of underlying processes, principles or mechanisms; it leads to a problem-solving activity; it is formulated in the most concrete way possible and has a degree of complexity adapted to the students' previous knowledge.

The problem is usually presented to the students in written form and can be presented as a story, illustration, graph, case.

The problem must be realistic and it must have the capacity to generate hypotheses, giving rise to a balanced vein of arguments. It must require adequate study time.

The students.

Groups are usually made up of 6-8 students who actively participate in the discussion of the problem under the guidance of the tutor, do an initial brainstorming, formulate explanatory hypotheses, identify the topics of study, study independently on texts of their choice or recommended by the teachers in a specific bibliographic list, then summarize to colleagues and evaluate the group process. The active participation of students in all phases of the process places the PBL among the methodologies centered on learning.

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The role of students is active. They actively participate, learn to discuss a problem and listen to each other. They formulate hypotheses, activate their previous knowledge, identify the objectives of the independent study, summarize to colleagues what they have found on the various bibliographic sources, evaluate their own work and that of colleagues, express judgments on the goodness of the problem and the way in which the role of the tutor is carried out. They are responsible for the success of a good session.

The 10 steps procedure.

Schimdt (1983) identified 7 phases of work, which were then transformed into 10 by Lotti and Sasso in 2006.

The tutor guides the students according to the procedure of the 10 steps.

The procedure requires that in the learning experience the problem is first encountered, without any previous preparation or study. The problem situation is presented to the students in the same way as it is presented in reality, the student works with the problem in a way that allows him to reason, challenge and evaluate his knowledge. The learning areas necessary to proceed with the work and which serve as a guide for individualized study are identified; the skills and knowledge acquired in this study are applied to the problem to assess the effectiveness of learning and strengthen it. The learning that has taken place by working with the problem and in individualized study is synthesized and integrated into the knowledge and skills already possessed by the student.

For each step the tutor asks specific questions to allow the student to progress correctly.

Table 1. The ten steps of PBL procedure.

STEP	ACTIONS	QUESTIONS FOR STUDENTS
STEP 1	Clarify terms and concepts that are not completely comprehensible	Are there any terms or data that are not clear to you or that you do not understand?
STEP 2	Define the problem	What information do you have? What is the thing to explain?
STEP 3	Analyse the problem searching for explanatory assumptions and hypothesis	What are the possible explanations for this problem? What are the causes? Why is there this problem? Or if we are faced with the resolution of a case: how could this problem be solved?
STEP 4	Formulate a systematic inventory of the hypothesis	What is the most likely hypothesis? How do the various hypotheses connect?
STEP 5	Formulate learning objectives	What gaps in knowledge do we have? Where can we find confirmation? Answers? In-depth studies? On which books? And where are these books?
STEP 6	Individually study and collect additional information outside the group	
STEP 7	Synthesize and evaluate recently acquired information	What did we find? How do you integrate the various information found? Do we all

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		agree?
STEP 8	Formulate research questions	What is still missing from the complete solution of the problem? Do we still have to look for new elements?
STEP 9	Evaluate group work	How did each of you participate? What was your commitment to researching information? What worked in the group? What went wrong?
STEP 10	Evaluate personal work	How did I work for this problem? Have I worked hard? Have I studied?

The learning setting.
A learning environment is dedicated, including many small cars for the meeting of individual groups of students, a well-stocked library open for many hours, a computer consultation room, a series of educational workshops for simulations and role-playing games where you can perform integrated activities.

3.1.3 PBL as a toll for orientation

PBL can be configured as a methodology "with an orientation function" since the ability to make decisions is a training ability that must be learned and as such, must be taught through simulation strategies.
Therefore, considering that, on the one hand, orientation is a process aimed at building decision-making skills (essential to know how to consciously and responsibly direct one's professional and existential path) and that, on the other hand, the PBL is a teaching methodology that allows the subject to learn to analyse and solve problems and therefore to strengthen their decision-making skills, it follows that the application of this method could be particularly effective and productive in all those situations in which it is possible to design and implement guidance interventions. The PBL, by training the student to exercise this type of skills allows the resolution of learning problems and stimulates the acquisition of a set of behaviours and skills such as:
- define a problem through the use of the information you have available;
- search for useful information for problem solving, experimenting with a form of collaborative learning;
- critically evaluate the information available;
- listen, ask for clarifications, exchange information;
- solve problems;
- make decisions;
- problem-solving, researching and deepening knowledge, through the formulation and argumentation of one's own hypotheses;
- planning objectives and managing learning times;
- planning the various phases of a work;
- build models;
- work in groups,
- express themselves correctly;
- use active listening techniques.

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In addition, the PBL motivates lifelong learning, accustoming the student to question their knowledge by monitoring, constantly evaluating and highlighting the limits and partiality but, at the same time, defining the possible integrations, the appropriate revisions, the necessary updates.
The student, therefore, through a didactic based on PBL, can acquire a certain degree of expertise in solving problems when he can make the most of his personal skills in making decisions, in order to maximize performance. Therefore, within the PBL group dynamics, additional key skills can be capitalised on such as:
- ability to communicate and work in a team;
- ability to take responsibility for their own choices;
- ability to solve concrete problems in an original way;
- ability to reflect, analyse and correct one's actions.

In particular, through the discussion of the group, the PBL helps to deconstruct and redefine the hypotheses not adequately founded and to solicit the critical argument, thus configuring itself as a tool aimed at the formation of a "critical thought", essential to be able to "orientate" within an increasingly complex society.

3.1.4 How to manage a PBL activity

PBL activities consist of 4 phases: conception, planning, execution and closure. For each phase, we have related activities, deliverables and evaluation tools. The deliverables represent what the project groups actually deliver to the professor.

Table 2. Phases of the PBL activity.

Phase	Activity	Deliverable	Evaluation
Before the beginning	Define projects number; Establish if activity will be mono-multi-inter disciplinary; Choose the topics; Build the group or groups of students;		
Conception	Define the project idea	Conceptual map	X
Planning	Split the project into macro-activities and assign them to individual students; Define who does what and when.		
Execution	Development of the project;	Final project	X
Closure	Present project results and process documents;	PPT presentation	X

Before the beginning.
Before the beginning of the PBL activities within the class, professors should do some activities.

(a) Decide on the number of projects: one for the whole class, for sub-projects or for separate projects.

It is very important that the professor immediately decides whether he prefers to have a single project to work on the whole class (even if divided into subgroups to which subprojects are delegated), or if he prefers to have a series of separate projects to work on the different groups. The single project mode frightens the novice professor in PBL less as he is confronted with a single theme, even if divided into several subtopics. He is encouraged by the fact that the subject of reference is restricted. The case of several distinct projects is different. In reality, in both cases the professor must feel that he or she is above all the master of the method and must not be afraid of the situation in which he or she is not the master of all the subjects.

(b) Decide whether mono-multi-interdisciplinary or extracurricular projects

It is often the case that teachers give up on the PBL because they do not find colleagues who are willing to collaborate. It is clear that multidisciplinary or interdisciplinary projects are preferable to monodisciplinary ones.

(c) The choice of themes

For the choice of themes, there are different possible approaches, to be evaluated in relation to the context. Generally, the professors provide the themes, the project ideas. Sometimes, the students themselves choose them while still respecting certain constraints imposed by the professor. One of the possible approaches, which is very widespread, is that of the professor chooses a single theme, a single project, which can then be split into sub-projects that are assigned to the various subgroups. There is also the possibility to choose different themes for different projects.

The moment is very delicate and must be approached with great attention. A correct choice of topics must harmonize two major requirements: to engage students in tasks that contain the complexity of everyday life and, at the same time, induce them to deepen issues close to the school curriculum. Not paying due attention to one of these needs means either falling back into simplified tasks, which are not authentic, and therefore difficult to educate to life skills, or neglecting disciplinary issues with the risk of creating gaps in knowledge in the students.

(d) Building the groups

Project development can also be an individual operation, but we believe that real projects should be addressed by a team and that learning to work in a team is a very important life skill. The fundamental criterion is to compose heterogeneous groups. Students with different backgrounds, with different skills, experiences and interests represent a wealth.

Conception.

The first step that the professor asks the students to address is the definition of the project idea. Students can define a project idea in many ways and, if not guided, they risk being disoriented, lost and telling generic things. In this phase, there are three fundamental steps: 1) identify the potential users of the product or service that are about to be implemented; 2) analyse their needs, their needs; 3) imagine, evaluate the characteristics of the product or service that you want to implement to meet the needs that have emerged.

Deliverable. The definition of the project idea can be summarized in a concept map. This deliverable summarises the project idea, including the analysis of the users and their needs and the evaluation of the appropriate product/service. It is a very important pedagogical moment: it

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engages the students in operations of analysis, synthesis and evaluation that are not present in traditional didactic practices. The map is composed, besides the title of the project, of three levels: one for the description of the users, one for the needs and finally one for the characteristics of the product.

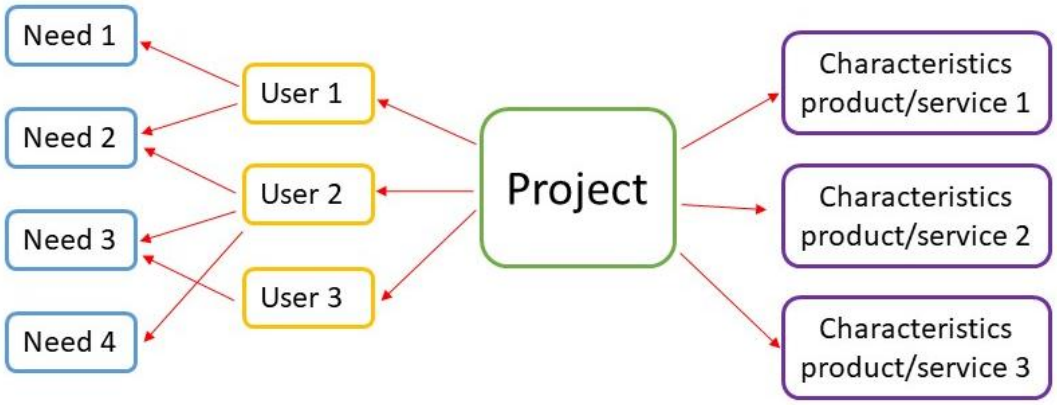

Figure 2. Example of conceptual map.

Planning.

The main actions to be carried out at this stage are:

- Define the activities in detail and the related resources needed;
- Assign the activities to the individual elements of the group, in short, define who does what;
- Estimate the execution times of the various activities.

That's the plan for the project. The phase of creation of the project plan is a very difficult phase to be carried out in class. Students prefer to do things over abstract planning. Detailing the possible activities and resources, accurately defining the scheduled times (scheduling) and specifying the specifications of the product-service, are difficult tasks for the students and we do not believe it is necessary and productive to insist on them. It is also necessary to inculcate in the students, but also in the professors, the idea that the plans are made to be rebuilt. In short, it is physiological to make forecasts that will be recalibrated; it is not pathological. Damping the anxiety for the perfect project plan (impossible to do!) must be one of the priorities in this phase. Having said that, on one request we cannot and must not compromise: the identification of probable macro-activities and their attribution to the individual members of the group. At the end of this phase, each member of the group must be associated with the tasks to be performed and on which it will be evaluated.

Deliverable. The minimum project plan is the deliverable in which students report the essential information: macro-activity, resources, who does what and the expected time.

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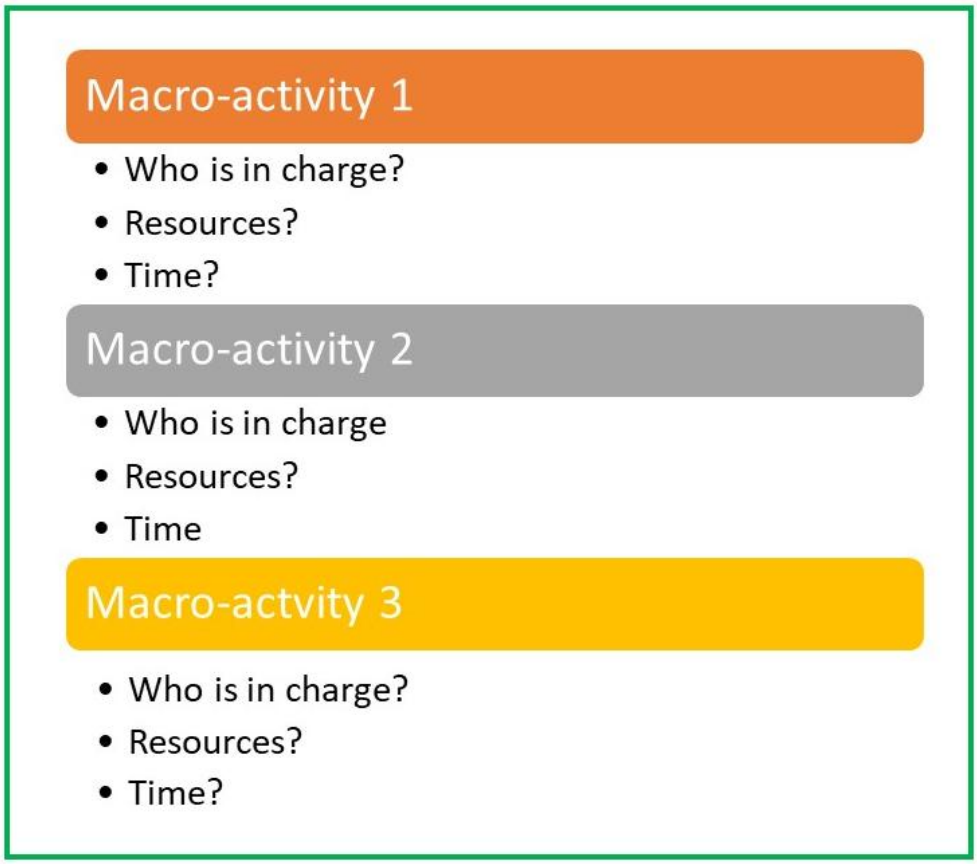

Figure 3. Example of plan activity.

Execution.

This is a very important phase from an educational point of view. It is the moment when students build advanced knowledge. The more we succeed in making the learning environment richer, in terms of the cognitive resources that students can draw on, the more points of view they can consult, the more this experience will be transformed into the desired path that will allow them to gradually transform "know how" into "know how" and that will allow them to develop, among others, that competence that is universally considered fundamental today, which is learning to learn.

The development of projects involves the resolution of many problems encountered in the process. What differentiates the resolution of problems typical of the university environment from those of the daily extra-university is that in the classroom students are used to dealing with structured problems, with only one solution, such as mathematical, physical or other. In everyday life problems are unstructured, without a precise solution, where being good means finding the solutions less worse. The way of proceeding for the solution of problems encountered during the development of a project is similar, for successive approximations, and the student narrating and narrating the solutions found gets used to the reflection during the action.

Deliverable. The narration document is the document/diary that narrates the reflections, strategies, choices, doubts, fears and certainties of the students in facing the different moments of the project's development. It is organized in three columns. The first column contains a date, the second contains a surname or group text, the third a reflection or an action.

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Table 3. Example of the structure of narration document.

Date	Name	Action / Reflection

Closure.

The bulk of the project is now complete. The students defined the project idea, planned its development and implemented the product or service. Now they will have to present the work done, communicate the results achieved. The presentation as we conceive it will be done in multimedia mode, possibly using Power Point or similar, and will be addressed to the rest of the class, the teacher or teachers. Sometimes it can be extended to various stakeholders or even to a larger auditorium, taking advantage of public moments. Each member of the group will present the part of the work carried out by him and this will allow an individual evaluation as well as group. The presentation becomes a fundamental moment to train the students in communication. The presentations of the various groups take a long time, so it is good to regulate them properly and try to organize everything in advance. It is good and educational to empower children, so that they get used to not take anything for granted. It is also a time for reflection and evaluation. Students can be asked to express themselves on the results achieved in relation to the forecasts, on best practices and on the lessons learned.

Deliverable. The presentation in digital format. It's the deliverable, usually made of slides, which summarizes the design process and the results achieved

3.1.5 How to evaluate PBL activity

In order to evaluate students work during and at the end of the PBL activity, it will be ask to students to develop some deliverables. Deliverables will be then analysed and evaluated by the professor or the commission of professors, by using some matrix as those reported below.

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Table 4. Matrix for the evaluation of the conceptual map.

	1	2	3	4	5	Score	Life skill
Respect of delivery times	The study is delivered more than 7 days late	The study is delivered more than 3 days late	The study is delivered with a delay of less than 3 days	The study is delivered on time			Liability
Activities identification	Students are not able to break down objectives into activities that demonstrate feasibility		Students disaggregate the objective into activities according to criteria that are not entirely rigorous but nevertheless sufficient to ensure the feasibility of the project	Students almost always break down the objective into activities almost always according to criteria of priority, logical sequencing and feasibility	Students almost always break down the objective into activities always according to criteria of priority, logical sequencing and feasibility		Problem solving; Organization
Description of the activities in terms of actions and resources	Students do not identify all the actions and/or resources needed to carry out the project		Students identify all actions and/or sufficient resources for the implementation of the project; the structure is not always detailed and precise	Students identify all the actions and/or resources for the implementation of the project; the structure is almost always detailed and precise	Students identify all the actions and/or resources for the realization of the project; the structure is detailed and precise		Problem solving; Organization
Sequence of activities (time	The timing is not based on activities, there is no organisational principle and		The times are based on the activities; some critical points emerge that do not prevent the feasibility	The times are dimensioned on the activities in a strategic and organized way; the			Problem solving; Organization

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estimation)	feasibility is in doubt		of the project	project is feasible			
Interaction with professors (evaluation of the process)	Students ask for support occasionally and without applying a survey and research strategy	Students ask for support on a continuous basis but without applying a survey and research strategy	Students regularly ask for support in trying to establish an investigation and research strategy	Students ask the professor for support in defining some aspects of their investigation and research strategy	Students ask the professor in a problematic way, demonstrating that they have a strategy and an autonomous working methodology		Learning to learn
Conceptual map's explanation at the time of presentation	Students are not able to argue choices made about activities, resources and timing	Students only partially argue about the choices made in terms of activities, resources and time	Students argue about choices made about activities, resources and timing	Students argue about their choices in terms of activities, resources and time by demonstrating considerable awareness of the processes of interpretation and problem solving.			Communication
					Total score		

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Table 5. Matrix for the evaluation of the project presentation (group).

	1	2	3	4	Group score	Life skill
Preparation (Respect of the times in the preparation of the presentation)	The presentation is prepared with a delay of more than 7 days	The presentation is prepared with a delay of more than 3 days	The presentation is prepared with a delay of less than 3 days	The presentation is prepared in time		Liability
Respect for timing in the presentation process	The presentation is made well beyond the time limits established	The presentation is made beyond the time limits established	The presentation is on time			Communication
Quality of the presentation (structure, layout)	The presentation contains only some information, there is a prevalence of images or written parts, there is no particular solution in its realization	The presentation does not contain all the main information, there is a good balance between images and written parts, there is no particular solution in its realization	The presentation contains all the main information, attracts attention and is original in its realization	The presentation contains all the main information, attracts attention and is original in its realization and there is a good balance between images and written parts		Communication
Formal accuracy	5-6 errors appear in the presentation	3-4 errors appear in the presentation	1-2 errors appear in the presentation	There are no errors in the presentation		
Organization	The public cannot follow the presentation because the information is not organized in a sequential way	The public sometimes has difficulties in following the presentation, which is often carried out in an unstructured way	The public follows the presentation because the information is organized in a logical and sequential way	The public is involved in the presentation because the information is organized in a logical and interesting way		Communication
				Total group score		

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Table 5. Matrix for the evaluation of the project presentation (student).

	1	2	3	4	Student score	Life skill
Knowledge of the contents	The student does not know how to answer questions about the subject, demonstrating that he only knows the subject superficially	The student can only answer easy questions by demonstrating that he or she has sufficient knowledge of the topic	The student only answers the questions that are asked by demonstrating that he knows the part of his competence and sufficiently the arguments of the other members of the group	The student answers the questions by formulating examples and personal re-elaborations; he demonstrates a complete knowledge of the subject and a good command of the subjects of the other members of the group		Acquiring and interpreting information
Language-control and visual contact	The student shows that he gives little importance to the speed with which he expresses himself, to the tone of his voice, to grammar and/or follows the notes word by word	The student uses the right speed and tone for the voice, but uses a poor and incorrect language; he always has the notes under control.	The student expresses himself a little too quickly / slowly and/or with too low / high a voice; he occasionally looks at the notes	The student exposes correctly with the right speed and tone of voice, maintains visual contact with the presentation but never reads the notes		Communication
				Student score		
				Total (group + student)		

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Table 6. Matrix for the evaluation of the narration document.

	1	2	3	4	Score	Life skill
Respect the deadlines	The student does not make reflections	Only a few reflections are written in the narrative document within the agreed time frame	Almost all reflections are written in the narrative document within the agreed time frame	All reflections are written in the narrative document within the agreed time frame		Autonomy; Responsibility
Structure of the motivations for the design (uncertainties, doubts, motivations, strategies)	From the considerations never emerge the motivations that accompanied the student in the design process	From the considerations emerge partially and occasionally the motivations that accompanied the student in the design process	The considerations partially reveal the reasons that accompanied the student in the design process	The student constantly reflects and expresses himself in detail on the reasons that have accompanied him in the design process		Learning to learn; communication
Assessing one's own potential (self-assessment)	The student does not reflect on his own capabilities	The student reflects on his own capabilities only in some aspects and in a limited way	The student always reflects on his own capabilities but only in some aspects	The student reflects in an articulated and complete way on the his own capabilities		Planning capability; Communication
Assessing the potential of your team	The student does not reflect on the potential of the group to which he	The student reflects on the potential of the group to which he	The student always reflects on the potential of the group to	The student reflects in an articulated and complete way on		Planning capability; Communication; Autonomy;

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(evaluation)	belongs	belongs only in some aspects	which he belongs, but only in some aspects	the potentialities of the group of which it is part		Responsibility
Ability to place oneself in one's own context of action in a reflective conversation relationship	The student does not reflect on his/her own context of action and that of his/her own working group in relation to the subjective situation	The student reflects only on strategies aimed at determining his own context of reference	The student reflects on strategies aimed at determining his/her own reference context and understanding his/her own subjective situation	The student constantly reflects in an articulated and comleto way on the strategies aimed at determining his own reference context and his own work group.		Problem solving; Planning capability; Communication; Autonomy; Responsibility
				Total score		

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3.2 Educational methodologies: Experiential Learning

Experiences are now accelerated, fragmented, virtual, often contradictory; they can no longer be transmitted by generation, but must be built through a creative effort. It is necessary to "make" the experience and this happens when we transform the daily facts in learning. It takes shape a knowledge that is different from those traditionally present in the lexicon of trainers (knowledge, knowing how to do, knowing how to be). It is the fourth knowledge, the profound knowledge that comes from the experience actually lived. The concept of experiential learning was studied by John Dewey and Jean Piaget, but it spread thanks to the contribution of education theorist David A. Kolb, who, together with John Fry, developed the "theory of experiential learning", according to which "learning is a process in which knowledge is created through the transformation of experience".

Experiential learning is, therefore, a model of learning based on cognitive, emotional or sensory experience. It is a process where the construction of knowledge takes place through the observation and transformation of experience. Not, therefore, through the passive acquisition of notions, concepts, relationships. It is a learning model based on direct experience. Skills, knowledge and experiences are acquired outside the traditional classroom context and can include internships, studies abroad, trips, field research and projects of various kinds that include a real experience.

It is realized through the action and the experimentation of situations, tasks, roles in which the student, active protagonist, finds himself to put in field his own resources and competences for the elaboration and the reorganization of theories and concepts aimed to the attainment of an objective. It allows the student to face situations of uncertainty by developing adaptive behaviours and improving the ability to manage their emotionality in times of greater psychological stress.

It also allows to develop one's problem solving skills, also through creative ability, and to acquire self-awareness through self-observation and hetero-observation, in order to redefine any inadequate attitudes and to enhance constructive behaviours. The acquired experience becomes a heritage of knowledge of the student and will constitute the new starting point for further evolutions.

3.2.1 Experiential Learning (EL): approaches and theories

The concept of experiential learning was first explored by John Dewey, Kurt Hahn, Kurt Lewin and Jean Piaget, among others. It was made popular by David A. Kolb.

Kolb's Experiential Learning Theory (Kolb, 1984) defines experiential learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience."

Kolb's learning is circular and not only outlines the phases of experiential learning, but also offers a model of formative practice. It is divided into 4 sequential phases or stages (Kolb cycle):

1. the phase of concrete experiences (EC), in which learning takes place through perceptions and thus as a personal interpretation of experiences;
2. the phase of reflective observation (RO), in which learning derives from instead of understanding meanings through observation and listening;

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3. the abstract conceptualization (AC) phase, in which Learning comes from the analysis and logical organisation of information flows;
4. the active experimentation phase (AS), in which learning is the result of action, experimentation and verification of functioning for the purpose of evolution or possible changes.

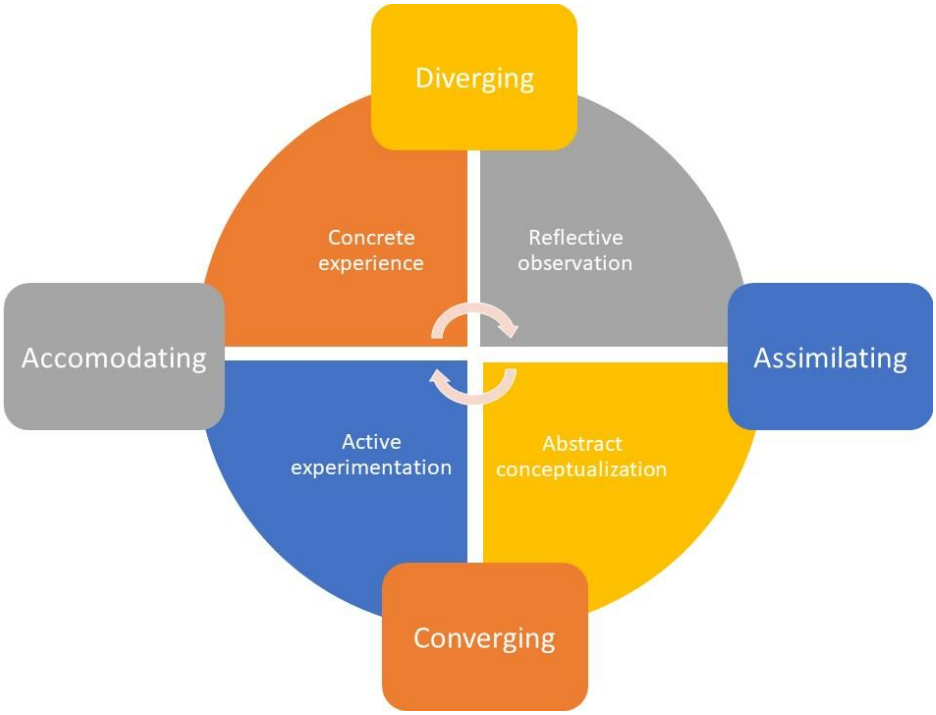

Figure 4. Kolb cycle.

These four stages support an effective and comprehensive learning process. It is possible start learning from anywhere in the cycle and each stage needs different skills to be done in the best possible way. The predilection for some of these stages generates different styles of learning.
In this way a dynamic virtuous circle is created in which the learner is the protagonist of a path in which the personal interest and the opportunity that is offered are to cross paths.
In addition to defining the cycle of illustrated learning, Kolb also offers styles of learning based on two axes:

- the first axis referred to the preference for reflexive observation (watching) or for the active experimentation (doing);
- the second axis to the preference for concrete experience (feel) or for the abstract conceptualisation (thinking).

From the combination of the two axes derive four learning styles:
- Accommodating style
- Divergent style
- Converging style
- Assimilation style

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Accomodating style: Uses trial and error rather than thought and reflection. Good at adapting to changing circumstances; solves problems in an intuitive, trial-and-error manner, such as discovery learning. Also tends to be at ease with people.
Divergent style: Emphasizes the innovative and imaginative approach to doing things. Views concrete situations from many perspectives and adapts by observation rather than by action. Interested in people and tends to be feeling-oriented. Likes such activities as cooperative groups and brainstorming.
Converging style: Emphasizes the practical application of ideas and solving problems. Likes decision-making, problem-solving, and the practical application of ideas. Prefers technical problems over interpersonal issues.
Assimilation style: Pulls a number of different observations and thoughts into an integrated whole. Likes to reason inductively and create models and theories. Likes to design projects and experiments.

3.2.2 Characteristics of the EL methodology

The most important characteristics of EL methodology are:
(a) Highly active learner role
(b) Habit of learning from experience
(c) Speed and constancy of learning
(d) Strengthening problem solving
(e) Collaboration capacity
(f) Transformations of the perceptions of reality (values, attitudes, behaviours, with a new mindset).
The learning process resulting from experience involves the mobilisation of important basic skills, such as the processing of the sets of information provided and their transformation into knowledge. Bion (1996) said that any experience can be taken as a model for future experiences: learning from experience is independent of a circular process of reflection that integrates experience in progress, reflection, conceptualisation and action. There is a holistic view in considering learning: cognitive, emotional, volitional aspects as well as social aspects are integrated and the whole person is involved.
Experiential learning is about a process of self-observation of one's own experience and implies:
- identification of the behavioural elements adopted and the operations carried out to allow the distinction between strengths and weaknesses and the improvement of expected performance;
- reflection on one's own behaviour, strategies, successes and failures, improving self-awareness;
- the definition of learning objectives (learning goal and learning need);
- identification of the ideal performance;
- the activation of a higher level of attention and concentration in the performance of the new experience.

EL can enhance students' learning through a range of strategies. These strategies can be organized into a spectrum, from strategies implemented within the classroom to strategies that take place in the community to strategies that take place in the work environment.
Course focused strategies can be implemented within a class. These strategies allow the students to explore an issue, reflect on concrete experiences, make connections between these

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experiences and background knowledge to theory and course content, and come up with generalizations and deeper understanding of the issue. Examples are role-play activities, case studies, inviting guest-speakers, concept mapping, and research projects.

Community focused strategies connect what students learn in their courses to what they experience within the community. These experiences range from observations and field notes on community events, to conducting interviews of community members and professionals, to field trips and visits to museums and sites of interest and relevance to their courses.

Work focused strategies refer to placements and internship. Placements provide the opportunity to students to apply what they have learned, theories and concepts, into a practice-related environment and provide relevant reflections of such work. Students are not being paid for their placement work, but they receive credit and, therefore, placements are evaluated. Students may complete their placement experience periodically and their attached courses provide opportunities for concrete reflections on the experience and remediation work if that is necessary. Internships refer to work assignments that are a required part of academic program degrees or certificates and allow students to apply and expand their knowledge and skills in a work-related, professional environment. Internships can be part-time of full-time jobs, for which the student receives reimbursement. There is an assessment component in the internship and students' work is evaluated based on predetermined learning goals set by all stakeholders involved.

3.2.3 Different forms of EL

Some forms of experiential learning include (Indiana University, 2006; Moore, 2010):

Internships. A more broad term used to describe experience-based learning activities that often subsume other terms such as cooperative education, service-learning or field experiences. It is often a credit-bearing, free-standing activity in a student's field of interest not connected to a theoretical course. It is usually assessed by a faculty member and supervised by an employer who is not a faculty member. The student may work with practicing professionals, complete a project, attend public events, interview and observe constituents and employees. The student may or may not be paid for this experience. When attached to a classroom course, a student may spend several hours a week volunteering in an agency, supporting co-curricular activities, shadowing a professional in the field, or observing people in their natural environments. Key to this form of experiential learning is some type of guided reflection. The mission of this experience may be to support the integration of theory and practice, explore career options, or foster personal and professional development.

Service learning. This term is used to denote optional or required out-of-classroom community service experiences/projects attached to courses or a separate credit bearing experience. The location may be the broader community outside the university or one embedded in co-curricular activities. In these experiences, students participate in an organized service activity that meets identified community needs and reflect on the service activity to better understand course content and gain a broader appreciation of the discipline and an enhanced sense of civic responsibility.

Cooperative education. Mostly a part of professional programs, students gain practical relevant work experience over a period of multiple terms that intersperse their coursework. Students alternate work and study, usually spending a number of weeks in study (typically full-time) and a number of weeks in employment away from campus (typically full-time). Alternatively,

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cooperative education may occur when students simultaneously attend classes part-time and work part-time during consecutive school terms in an intentionally planned and coordinated way. Students receive academic credit for cooperative education when the experiences meet the criteria for credit (i.e., faculty supervision, reflective components, evidence of learning). The purpose of these programs is to build student's career skills and knowledge.

Practicum. A relative of the internship, this form of experiential learning usually is a course or student exercise involving practical experience in a work setting (whether paid or unpaid) as well as theoretical study, including supervised experience as part of professional pre-service education.

Undergraduate research experience. Students function as research assistants and collaborators on faculty projects.

Community-based research. Faculty and students cooperate with local organizations to conduct studies to meet the needs of a particular community. Students gain direct experience in the research process.

Field work. Supervised student research or practice carried out away from the institution and in direct contact with the people, natural phenomena, or other entities being studied. Field work is especially frequent in fields including anthropology, archaeology, sociology, social work, earth sciences, and environmental studies.

Study abroad. Students usually engage in courses at higher education institutions in another country. The experiential learning component is the cultural immersion which provides novel challenges for navigating living in a new place. The coursework connected to a study abroad can also include internships and service-learning experiences.

3.2.4 How to evaluate EL activities

A rubric is the best instrument to evaluate

A rubric is a comprehensive set of criteria used to assess students on a specific task based on a list of performance levels to measure its quality (Brookhart, 2013). A good rubric serves three purposes: (1) it creates a systematic way to evaluate students on content knowledge, (2) it provides quick and easy feedback to both the professor and the students, (3) it measures teaching (Reeves & Stanford, 2009; Steven & Levi, 2013).

Rubrics consist of four parameters (Steven & Levi, 2013):

1. Assignment Description: this provides students with a full description of what the students must do to complete the task. This portion connects the assignment itself to the rubric. This will include directions, time limits, and criteria for the assignment.
2. Scale Level: scales help to distinguish student work, from the most exemplary to the poorest quality. There are no well-established rules on the number of levels, but some recommendations include a range between 3 and 6 levels for analytic rubrics (Arter & McTighe, 2001).
3. Dimensions: The dimensions of the rubric outline the desired skills the course instructor expects the students to demonstrate in the assignment. Each dimension must be linked and mapped back to the course, program, or institutional learning outcomes.
4. Dimension Criteria: The dimension criteria differentiates the quality of work between each scale level of each dimension. This section of the rubric allows instructors to compare what is expected of the students and what the students have produced.

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Rubrics also allow the professor to identify the areas that students need the most improvement Over time, if similar rubrics are used through the semester, professors can easily map patterns of growth and regression in student work. This allows faculty to make the necessary changes needed within their pedagogy and/or emphasize greater attention to students' weaker areas.

One way to ensure that students are meeting the criteria is to discuss the rubric in class. If students are aware of what is required from them before they begin the assignment, then they are less likely to stumble into common pitfalls.

Rubrics need to be adapted to the different experiential learning activities. In table t is reported a general one.

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Table 7. Rubric for EL activity evaluation.

Evaluation criteria	4	3	2	1
Meaningful connections between academic concepts and the experience	Meaningful synthesis of connections between concepts and application, which allows for a deeper understanding of the area of study and for a construction of a broader perspective.	Effective use of experiential education to understand concepts and theories in the area of study.	Comparison between experiential activity and academic concepts that indicate understanding of similarities and differences and the points of view of others.	Identification of links between experiential activity and ideas raised in academic readings and how these may agree and/or are related to individual's interests.
Reflection and self-evaluation	Ability to engage in reflective, creative and self-evaluative work that demonstrates learning growth and development by building to prior experiences and effectively applying skills across various and diverse contexts and situations.	Ability to engage on self-evaluation in regards to the learning progress and to identify and address ethical concerns and challenges in diverse contexts.	Ability to articulate own strengths and weaknesses in performing tasks and to use self-awareness to address challenges in other contexts.	Ability to provide a description of own performances on tasks with a focus on general successes and failures.
Integrative communication of knowledge and skills	Profound ability to communicate knowledge, skills and information in an integrative way that contributes to the enhancement of meaning (for the audience) and demonstrates how language, meaning-making processes, thought and expression are interdependent.	Ability to communicate knowledge, skills and informative in various formats effective for a targeted audience and to make explicit connections between what is communicated (content) and methods of communications.	Ability to present knowledge, skills, and information in formats that illustrate the connection between content and method in a basic way.	Ability to present knowledge and information in an appropriate form.

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Application	Ability to make adaptations and apply knowledge, skills, theories and methodologies to new experience and to solve problematic situations with originality and novelty.	Ability to make adaptations and apply knowledge, skills, theoretical concepts and methodologies to new experiences and to solve problems.	Ability to use knowledge, skills, theoretical concepts and methodologies in order to contribute to the understanding of problematic situations.	Ability to use knowledge, skills, theoretical concepts and methodology at the situation at hand.

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ANNEX 1

Case study 1.

Sections

Food production systems
Use of technologies and ICT in UA
Urban agriculture entrepreneurship

Student workload

Problem desktop research 16 hours.
Team discussion and analysis 8 hours.
Developing/testing solutions 16 hours.
Analysis 8 hours.

Problem background

WB agriculture has a high share of small agricultural households, especially urban and peri-urban farms. Those farms are characterised with small income input, low technology development and limited resources. Due to the close proximity to urban areas, available space and time are factors influencing farm production.

Problem description

Small agricultural households own 1000 m^2 land and 500m^2 greenhouses for strawberry production. Greenhouse strawberries are most important household income. Strawberries are produced in 2 years cycle, on soil using mulch foil and irrigation system. Strawberries are harvested till end of April. Small agricultural household would like to generate additional income by producing greenhouse vegetables from May to December.

Problem conditions

Small agricultural household has limited funds (1.000 to 3.000 €) to invest in project for long term solutions only. Work hours can be increased for 10 hours per week.

Methodology

Propose different strawberries production systems.
Calculate investments for each production system.
Propose new business plan.
Test proposed solutions.
Analyse and discuss proposed solutions

Learning outcomes

Students will demonstrate ability to critically research problem, identify available solutions, adapt them to specific situation and conditions, implement and analyse proposed solutions.

Food production systems

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Students will demonstrate knowledge in different plant production systems (vertical, soilless, etc) using different solutions (modular, mobile, etc). Students will demonstrate ability to plan and implement plant production systems and to evaluate efficiency.

Use of technologies and ICT in UA

Students will demonstrate knowledge regarding automatisation of plant production as a way to reduce farmer's workload and time consumption. Students will demonstrate ability to plan and implement ICT technologies (sensors etc) in plant production process and to evaluate their efficiency.

Urban agriculture entrepreneurship

Students will demonstrate knowledge regarding business model canvas and value proposition canvas, describe business ideas and write a business plan.

Evaluation

Hard skills - 40% in theory (content – knowledge assessment)
Plant production
Machinery / Engineering
Project planning
Business Planning, Administration & Finances
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any?

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What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

Minimum standards

Students must achieve a minimum of 40% in theory and 60% accuracy in practical. At the end of the course a proficiency test, covering all subjects during the course, will be given. Results of the test will be given to the individual participant, but no official marks will be reported. A Certificate of Attendance will be given to participants who have attended more than 90% of the scheduled training time and who have completed the course.

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Case study 2.

Sections

Nursery production systems
Modern nursery production in UA
Urban agriculture entrepreneurship

Student workload

This qualification is a 50-50 mix of theoretical and practical studies with use of the University nursery, hydroponics unit and the two hectares nursery production facility to produce vegetable and fruit nurseries. Students will also undertake work experience within different nursery producers, enabling development of practical skills for nursery production and distribution.

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

There is a lack of space in urban areas and even when there are still unused public or private lands, the prices are very high. These land rent issues sometimes become the biggest obstacle to urban agriculture and discourage farming. There is a lack of water sources in urban areas but low cost water saving technologies such as drip irrigation can help to increase water efficiency. Soil and water pollution is also another obstacle in urban farming in urban areas.

Problem description

Agricultural household is a business located about 5 km from the capital city. There is 0,5 hectare available and 1,000 m^2 greenhouse used to produce vegetables (tomato, pepper, cucumbers) with the option to expand to vegetable and fruit nursery production. The nursery will be an operation to produce varieties grown from seed or cuttings. The initial market research will provide some information on the types of plants to grow, for which there is a market. Further plant varieties can be produced according to market demands, the availability of stock, and skill levels and business facilities. The markets for these plants will be retail and wholesale mainly in the area of capital city. Other markets might include direct sales to individual or family farms, group or cooperative farms and commercial enterprises at various scales ranging from small farms (the majority) to medium-sized and some large-scale enterprises.
The aim is to produce at least 80,000 plants in the first year (60,000 vegetable plants and 20,000 fruit tree plants), increasing to 200,000 within five years (150,000 vegetable plants and 50,000 fruit tree plants). The nursery will require a small work building, storage areas for nurseries, and the existing greenhouse. The nursery will initially provide work to two full time workers, and four part time staff, experienced personnel, plus trainees. Returns based on an average price of € 0,8 per fruit trees plant and € 0.1 per vegetable plant.

Problem conditions

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Agricultural household has funds of € 10,000 to invest in project. Since funds are limited, the economic aspects of the enterprise must be well organised, with an accurate planning as possible. Start-up costs will be calculated, and the source of funding confirmed. Ongoing monthly costs will be estimated, and methods of payment established.

Methodology

Selection of products and quality control measures / decisions regarding adoption of technology
Developing innovative management mechanisms applicable to horticultural businesses
Identifying marketing opportunities suitable for different size horticultural operations
Finance, marketing and human resource management
Need analyse for people with skills and knowledge in managing production plant nurseries

Learning outcomes

Students will develop a broad concept plan to critically research problem for developing the site. Identify available solutions to include the garden and stock plant areas in addition to the nursery arrangement, and prepare plan for expansion and future developments. Ensure there is adequate propagating material available.

Food production systems

Students will demonstrate knowledge in different nursery production practice on horticulture crops from development of land till post harvesting techniques, focused mainly in plant breeding, raising seedlings and seeds, plants propagation technology, production of vegetable nurseries in poly house and net house, propagation methods of layering, pruning, and trimming, and risk management in the production and marketing of specialty crops. The following resources provide excellent information regarding the proper management of production, marketing, financial, legal, environmental, and human resource risks.

Use of technologies and ICT in UA

Students will demonstrate knowledge regarding seasonal vegetable production in poly house and net house by using precision farming. Students will demonstrate ability to plan and implement ICT technologies (sensors etc) in plant production process and to evaluate their efficiency. Students will implement e-commerce performance in the nursery business to apply information technologies to the marketing of green industry products and services.

Urban agriculture entrepreneurship

Students will demonstrate knowledge regarding business model canvas and value proposition canvas, describe business ideas and write a business plan.

Hard skills - 40% in theory (content – knowledge assessment)
Plant production
Machinery / Engineering
Project planning
Business Planning, Administration & Finances
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence

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Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility

How to be evaluated:

Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

Minimum standards

Students must achieve a minimum of 40% in theory and 60% accuracy in practical. At the end of the course a proficiency test, covering all subjects during the course, will be given. Results of the test will be given to the individual participant, but no official marks will be reported. A Certificate of Attendance will be given to participants who have attended more than 90% of the scheduled training time and who have completed the course.

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Case study 3.

Sections

Harvesting, handling, packaging and storage of fresh fruit and vegetables
Quality assurance, research and extension activities related to fresh produce quality, safety and marketability in UA
Urban agriculture entrepreneurship

Student workload

The learning module is a 15 days intensive study on harvesting, handling, packaging and storage of fresh fruit and vegetables. It is designed for research and extension workers, quality control personnel in the produce industry, and business, government or academic professionals interested in current advances in the postharvest technology of horticultural crops. It is particularly of interest to technical professionals responsible for quality assurance, research and extension activities related to fresh produce quality, safety and marketability.
This qualification is a 60-40 mix of theoretical and practical studies on the basic principles behind the factors and processes affecting postharvest quality and understands how to apply this information in their daily practice by developing strategies to maintain postharvest quality. The participants will be able to understand major physiological activities and biological changes that reduce the postharvest life of fresh products. Various factors that affect shelf life of the produce will be described. Basic methods of primary processing such as grading, sorting, cleaning, de-handing, trimming, packaging and storage will be practiced. Principle and practices of processing and preservation will be taught.

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

Postharvest losses of fruit and vegetables are very high depending on a crop. Lack of postharvest management skills and technology such as temperature control to maintain the cold chain, value addition, and packaging have caused several damages to the business community in Kosovo. Postharvest technologies such as controlled ripening, temperature management, and chemical treatment methods are potential tools to reduce postharvest losses, increase food and nutritional security and ensure final consumer safety.

Problem description

A small business operator located on the urban area dealing with fruit and vegetables has high postharvest losses that exceed 30%. Many factors contribute to postharvest losses such as mechanical damage, poor temperature and relative humidity control, and pests and diseases. The aim of this business is to reduce the rate of postharvest losses through investments in capacity development and adoption of improved technologies and infrastructure. These improved techniques and procedures will result in good postharvest management that will also increase market access, profits, and income generation. The aim is to decrease postharvest losses by 30%

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through improving knowledge and availability of appropriate varieties for processing and other value added markets. Next step is improved equipment for harvesting and facilities for value addition such as sorting, grading, cleaning, preservation, packaging, storage and distribution. And very important is training, research and development on pre-harvest and postharvest systems in order to improve the knowledge and skills.

Problem conditions

A small business operator has funds of € 25'000 to invest in project. Since funds are limited, the economic aspects of the enterprise must be well organised, with an accurate planning as possible. Start-up costs will be calculated, and the source of funding confirmed. Ongoing monthly costs will be estimated, and methods of payment established.

Methodology

Intensive lectures and discussions as well as hands-on laboratory sessions on the faculty facilities.
Field tour covering a wide variety of postharvest operations, including selected packinghouses, cooling and storage facilities, produce distribution centers, field harvest operations, packing, and transportation facilities in various locations in Kosovo.
Developing innovative management mechanisms applicable to FV post harvest businesses
Finance, marketing and human resource management
Need analyse for people with skills and knowledge in managing post harvest businesses

Learning outcomes

Students will identify and develop available solutions for harvest, handle, package and store fresh fruit and vegetables in optimum condition, with the minimum of loss or spoilage. Identify a wide range of fruits and vegetables, storage life and recommended storage conditions. Maintain hygiene in the storage facilities (washing, disinfection, etc.) and quality assurance of products (HACCP).

Food production systems

Students will demonstrate knowledge in Introduction to various post harvest operations such as primary processing operation vs. secondary operation. Operations like harvesting, handling cleaning, grading, sorting, drying, storage, milling, size reduction, expelling, extraction, blending, heat treatment, separation, material handling. Temperature and moisture changes during storage i.e. influence of moisture content, relative humidity, temperature, fungi etc. on stored product. Factors: temperature, relative humidity, gases and pre-cooling of the produce. Principles and methods of storage Methods of storage; cold storage, modified atmosphere storage, controlled atmosphere storage, cellar storage and rustic storage.

Use of technologies and ICT in UA

Students will demonstrate knowledge regarding new technologies for the preservation of fresh fruits and vegetables, emphasizes technologies that are more environmentally sustainable and economically competitive, consumer behavior in response to postharvest technologies, and provides modeling approaches for predicting changes in postharvest quality.

Urban agriculture entrepreneurship

Students will demonstrate knowledge regarding business model canvas and value proposition canvas, describe business ideas and write a business plan.

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Hard skills - 40% in theory (content – knowledge assessment)
Plant production and postharvest procedures
Machinery / Engineering
Project planning
Business Planning, Administration & Finances
How to be evaluated: test

Soft skill linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

Minimum standards
Students must achieve a minimum of 40% in theory and 60% accuracy in practical. At the end of the course a profiency test, covering all subjects during the course, will be given. Results of the test will be given to the individual participant, but no official marks will be reported. A Certificate

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of Attendance will be given to participants who have attended more than 90% of the scheduled training time and who have completed the course.

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Case study 4.

Sections

Resources use efficiency in urban context
Food production systems
Use of technologies and ICT in UA
Urban agriculture entrepreneurship

Student workload

This qualification is a 60-40 mix of theoretical and practical studies with use of the design of layout of the farm based on the available land; division of the farm and advice on the different blueberry varieties; advice on the plants, age, quality and amount suitable for this farm. Students will also undertake work experience within different blueberry producers, enabling development of practical skills for blueberry production and distribution.

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

There is a lack of space in urban areas and even when there are still unused public or private lands, the prices are very high. These land rent issues sometimes become the biggest obstacle to urban agriculture and discourage farming. There is a lack of water sources in urban areas but low cost water saving technologies such as drip irrigation can help to increase water efficiency. Soil and water pollution is also another obstacle in urban farming in urban areas.

Problem description

Agricultural household is a business located about 1.5 km from the city. The total area is 5 ha, while the plant part includes 4.2 ha. The total number of plants in the entire plot is 23'100 plants. The orchard is divided into four (4) plots:

Plot A:

It has a total area of 1.1. ha. It is planted with the DUKE variety. The distance between the plants is 0.80 cm while in the middle of the order 2.5 m. With a total number of plants per parcel of 5740. The plants are distributed in 36 gratings.

Plot B:

It has a total area of 1.1 ha. The distance between the plants is 0.80 cm while in the middle of the order 2.5 m. With a total number of plants per parcel of 5740.

It is planted with three-year-old and two-year varieties DUKE (three years old), Huron (two years old) and SPARTAN (two years old). With varieties DUKE are 17 grain plants, with 2650 plants with HURON 9 variety with 1400 plants, and with SPARTAN variety, 7 renders with 1100 plants. There are three test strips in this parcel, with three varieties: LIBERTY, DRAPER and AURORA. The total number of plants in these ranges is 590.

Plot C:

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It has a total area of 1.2 ha. The distance between the plants is 0.60 cm while between the 2 m, with a total number of plants per parcel of 9250. It is planted with two-year and three-year crop varieties: BLUEGOLD, STAR, SPARTAN and DUKE.
The BLUEGOLD variety (two years) has 27 straws, with 6250 plants.
The STAR variety (two years old) has 3 straws, with 700 plants.
The SPARTAN variety (two years old) has 5 straws, with 1150 plants.
The DUKE Variety (three years) has 5 straws, with 1150 plants.
In this plot plants are planted in a vase, with a ready substrate.

Plot D:

It has a total area of 0.80 ha. It is planted with three-year varieties of plants DUKE. The distance between the plants is 0.80 cm while between the order 2.5 m, with a total number of plants per plot of 2370 plants. In this parcel there are 16 long rows, with 112 plants per order, and 14 short order with 41 plants on average for the order.
Fresh blueberries kg 5.60 euro, for export 6.0 euro Month July - August
Fresh blueberry kg 8.0 euro per parcel, Month June.
Further plant varieties can be produced according to market demands, the availability of stock, and skill levels and business facilities. The markets for these plants will be retail and wholesale mainly in the area of capital city.
Other markets might include direct sales to individual or family farms, group or cooperative farms and commercial enterprises at various scales ranging from small farms (the majority) to medium-sized and some large-scale enterprises. The blueberry will initially provide work to two full time workers, and four part time staff, experienced personnel, plus trainees.

Problem conditions

Agricultural household has funds of € 20'000 to invest in project. Since funds are limited, the economic aspects of the enterprise must be well organised, with an accurate planning as possible. Start-up costs will be calculated, and the source of funding confirmed. Ongoing monthly costs will be estimated, and methods of payment established.

Methodology

Stage one: designing and building the plantation
Stage two: exploitation phase (making use and benefiting from resources)
Stage three: trading and packing
Selection of products and quality control measures / decisions regarding adoption of technology
Developing innovative management mechanisms applicable to horticultural businesses
Identifying marketing opportunities suitable for different size horticultural operations
Finance, marketing and human resource management
Need analyse for people with skills and knowledge in managing production plant nurseries

Learning outcomes

Students will develop a broad concept plan to critically research problem for developing the blueberry. Identify available solutions to include the plant areas in addition to the blueberry arrangement, and prepare plan for expansion and future developments. Ensure there is adequate propagating material available.

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Food production systems

Students will demonstrate knowledge in different blueberry production practice on horticulture crops from development of land till post harvesting techniques, focused mainly in plant breeding, raising seedlings and seeds, plants propagation technology, production of vegetable nurseries in poly house and net house, propagation methods of layering, pruning, and trimming, and risk management in the production and marketing of specialty crops. The following resources provide excellent information regarding the proper management of production, marketing, financial, legal, environmental, and human resource risks.Students will demonstrate knowledge in different assistance with harvesting, packing, exporting and selling the blueberries which includes: help and advice in selling the blueberries; help and know how in harvesting the blueberries; help and know how in storing the blueberries; help and know

how in packing the blueberries; help and know how in exporting the blueberries

Use of technologies and ICT in UA

Students will demonstrate knowledge regarding seasonal blueberries production in technical advice with regards to weed, insects and other threats to blueberry; advice for growing a good quality of blueberries; advice and control over the growth of the blueberry plants; advice and control in the water management of the blueberry plants; pruning demonstrations and help in rejuvenating the plants; unlimited help through telephone and email.. Students will demonstrate ability to plan and implement ICT technologies (sensors etc) in plant production process and to evaluate their efficiency. Students will implement e-commerce performance in the blueberries business to apply information technologies to the marketing of blueberries products and services.

Urban agriculture entrepreneurship

Students will demonstrate knowledge regarding business model canvas and value proposition canvas, describe business ideas and write a business plan.

Hard skills - 40% in theory (content – knowledge assessment)

Plant production
Machinery / Engineering
Project planning
Business Planning, Administration & Finances

How to be evaluated: test

Soft skills linked to accuracy in practical

Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility

How to be evaluated:

Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation

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SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING
What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

In order to avoid unpredictable events and to ensure safe blueberry, the producers are certified with different standards like:

- Global Gap (half of them already are certified, while the rest are in the process).
- Organic product certification

Meanwhile the processors are mostly certified with:

- ISO 22000
- HACCP
- IFS – U6

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Case study 5.

Sections

Sustainable food production systems
Environmental protection

Student workload

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

Increasing the soil salinity protected areas (greenhouses) is a common problem of farmers in Bosnia and Herzegovina. Salinity is increased mainly due to the incorrect application of fertilizers through the local irrigation system, usually, drip by drip. Due to the lack of experience and knowledge, irrigation systems are usually installed without proper guidelines, design, operation and maintenance practices and farmers are not familiar with scheduling techniques and proper management. Farmers are usually over-irrigating, and by doing so they are also giving a greater amount of fertilizer that the plans can't use properly. After the vegetation period is over, they mix the topsoil layer. In the first year yields are high, in second they start to drop and later they become very small. After a few years of such practice, the soil in the greenhouse becomes toxic for most of the plants. After that, for farmers, the only solution is to move the greenhouse to other location.

Problem description

Farmers engaged in production in a protected area (greenhouses) in BiH mostly use produced food for their own needs or they sell it on the local market. Production in the most cases is based on one or few smaller greenhouses up to 200 m^2. Irrigation is carried out by a drip system, which in addition to water include fertilizers. Irrigation tapes are placed in the rows, usually next to the plants. However, plant roots are also developing in the area that is not covered with irrigation. In addition, specific plants needs for the water are not monitored and irrigation is done when the farmer feels that the plant need the water.

This approach usually results in over-irrigation which, besides stimulating the development of plant diseases, leads to an increase in concentration of salts, thus higher concentration of plant nutrients that plants are unable to use.

This narrow zone of the irrigating area has a large concentration of nutrients, the soil's salinity is increased and use of fertilizer is higher which, among other things, increase the cost of production. Things are getting worse in the fall or spring when with the preparation of the soil when this salty part of the soil is spread through the entire surface of the greenhouse. After a few years of this production, the soil in the greenhouse becomes toxic to plants. Already in the second year, yields declined by up to 20%.

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The previous solution was moving greenhouses to a new location or changing the soil in the greenhouse. These solutions are ineffective and only deepen the problem especially from the aspect of the protection of the environmental and renewable resources such as soil and water.

Problem conditions

Smallholder farmers are very busy with current obligations, thus they weekly increase in working hours can be only 5h. Fixed assets investments may not exceed 1000 Euros per year.

The irrigation system can be changed or improved. This can require change or installation of a higher power pump, or valves and controller for automatic irrigation.

Through education and training farmers could get familiar with the problem and possible solution for overcoming it.

Farmers can keep track of local conditions, use a sort of irrigation calendar to track the needs of water for the plants.

Methodology

Install addition irrigation system in greenhouses

This implies setting up a sprinkler irrigation system next to the drip. This additional system will serve to flush out toxic soil elements. In addition, it can be used to cool space inside a greenhouse, fight against frosts and even for the regular irrigation.

Flushing out toxic soil elements at the end of vegetation period

Determine the real plant needs for water and nutrients

By monitoring the soil moisture status and climatic parameters (temperature and precipitation levels at the site), it is possible to determine the right time and the appropriate amount of water for irrigation.

Irrigation system automation

Test the impact of different solutions to the environment and the profitability of production

Analyse and discuss proposed solutions

Learning outcomes

Students will demonstrate ability to critically understand and research problem, identify available solutions, adapt them to specific situation and agro-conditions, implement and decide which solution is the best for the current situation.

Food production systems

Students will demonstrate knowledge in the determination of water requirements for the different plant production systems using different solutions (software, soil moisture monitoring, climate monitoring, etc). Students will demonstrate the ability to plan and implement irrigation scheduling plans that will increase the efficiency of production while protecting the environment.

Use of technologies and software

Students will demonstrate knowledge regarding the use of software for calculation of crop water requirements and production management. They will also develop the skills required to plan, develop and design complete or partial automation of irrigation systems.

Hard skills - 40% in theory (content – knowledge assessment)

Irrigation technologies and automation

Information technologies (IT)

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Environment protection
Problem solving
Machinery / Engineering
Project planning
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

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Case study 6.

Sections

Harvesting, handling, classification of grains and storage of Barley and planting artificially malt.
Quality assurance, research, storage of cereals and extension activities related to produce quality, safety and marketability in UA
Urban agriculture entrepreneurship

Student workload

The learning module is a 15 days intensive study on harvesting, handling, classification of grains and storage of Barley and malt. It is designed for research and extension workers, quality control personnel in the produce industry, and business, government or academic professionals interested in current advances in the postharvest technology of Barley and planting artificially malt. It is particularly of interest to technical professionals responsible for quality assurance, research and extension activities related to produce quality, safety and marketability.

This qualification is a 60-40 mix of theoretical and practical studies on the basic principles behind the factors and processes affecting postharvest quality and understands how to apply this information in their daily practice by developing strategies to maintain postharvest quality. The participants will be able to understand major physiological activities and biological changes that reduce the postharvest Barley and planting artificially malt. Various factors that affect shelf life of the produce will be described. Basic methods of primary processing such as grading, sorting, cleaning, de-handing, trimming, classification of grains and storage will be practiced. Principle and practices of processing and preservation will be taught.

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

Postharvest losses of classification of grains and storage of Barley and malt are very high, depending on a grain. Lack of postharvest management skills and technology such as temperature control to maintain the cold chain, value addition, and packaging have caused several damages to the business community in Kosovo. Postharvest technologies such as controlled ripening, temperature management, moisture are potential tools to reduce postharvest losses. Malt is germinated cereal grains that have been dried in a process known as "malting". Malting is the process of converting barley or other cereal grains into malt. The malting process starts with drying the grains to moisture content below 14%, and then storing for a time while it is needed for production.

Problem description

A small business operator located on the urban area dealing with barley and malting process has high losses that exceed 30%. Many factors contribute to malting process losses such as mechanical damage, poor temperature and relative humidity control, and pests and germination, removal of roots embryonic from seeds. The aim of this business is to reduce the rate of malting

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process losses through investments in capacity development and adoption of improved technologies and infrastructure. These improved techniques and procedures will result in good malting process management that will also increase market access, profits, and income generation. The aim is to decrease barley and losses by 30% through improving knowledge and availability of appropriate varieties for processing and other value added markets. Next step is improved equipment for harvesting and facilities for value addition such as sorting, grading, cleaning, classification, storage and distribution. And very important is training, research and development on pre-harvest collection and postharvest systems in order to improve the knowledge and skills.

Problem conditions

A small business operator has funds of € 35'000 to invest in project. Since funds are limited, the economic aspects of the enterprise must be well organised, with an accurate planning as possible. Start-up costs will be calculated, and the source of funding confirmed. Based on raw material the monthly payment will lower the overall cost. Ongoing monthly costs will be estimated, and methods of payment established.

Methodology

Intensive lectures and discussions as well as hands-on laboratory sessions on the faculty facilities.
Field tour covering a wide variety of postharvest operations, including selected cooling and storage facilities, field harvest operations, packing, and transportation facilities in various locations in Kosovo. Classification of preserving grains from moisture, insects, and sampling for analysis.
Developing innovative management mechanisms applicable to post harvest businesses
Finance, marketing and human resource management
Need analyse for people with skills and knowledge in managing post harvest businesses

Learning outcomes

Students will identify and develop available solutions for harvest, handle, classification and store Barley and processing of barley to malt, with the minimum of loss or spoilage. Identify a wide range of Barley and planting artificially malt , storage life and recommended storage conditions. Before barley can be used, there must be uniform moisture and then artificial planting and malting.

Food production systems

Students will demonstrate knowledge in Introduction to various post harvest operations such as primary processing operation vs. secondary operation. Operations like harvesting, handling cleaning, grading, storage, size reduction, extraction, blending, heat treatment, separation, separation of the barley seeds in the class, material handling. Temperature and moisture changes during storage i.e. influence of moisture content, relative humidity, temperature, fungi etc. on stored product. Factors: temperature, relative humidity, gases and pre-cooling of the produce. Principles and methods of storage Methods of storage; cold storage, modified atmosphere storage, controlled atmosphere storage, cellar storage and rustic storage. Conservation first in silos for barley, then processing and benefit of malt.

Use of technologies and ICT in UA

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Students will demonstrate knowledge regarding new technologies for the Barley and planting artificially malt, technologies that are more environmentally sustainable and economically competitive, consumer behaviour in response to postharvest technologies, and provides modelling approaches for predicting changes in postharvest quality.

Urban agriculture entrepreneurship
Students will demonstrate knowledge barley and malt processing.
Describe business ideas and write a business plan, to preserve the raw material for processing.

Hard skills - 40% in theory (content – knowledge assessment)
Plant production and postharvest procedures
Machinery / Engineering
Project planning
Business Planning, Administration & Finances
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects?

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How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

Minimum standards

Students must achieve a minimum of 40% in theory and 40% accuracy in practical. At the end of the course a profiency test, covering all subjects during the course, will be given. Results of the test will be given to the individual participant, but no official marks will be reported. A Certificate of Attendance will be given to participants who have attended more than 80% of the scheduled training time and who have completed the course.

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Case study 7.

Sections

Business development
Networking
Innovativeness
Agricultural policy

Student workload

- Problem desktop research 16 hours.
- Team discussion and analysis 8 hours.
- Developing/testing solutions 16 hours.
- Analysis 8 hours.

Problem background

Low level of competitive advantage of majority of agricultural producers in WB countries still represents major problem and obstacle for further development of agricultural and food industry sector. Past experience limit farmer's ability to cooperate, and therefore limit their ability to innovate and improve quality of their products, business and life.

Problem description

Majority of agricultural holdings in WB countries is characterized by small-mixed farms, with low level of machinery use, as well as low level of irrigation in place and low application of modern business practices (i.e. organic agriculture, urban agriculture, production with standards – GAP, or geographical indications – PDO, PGI, TSG). As a result, agricultural producers face several problems, such as: higher production cost (no economy of scale), low level of bargaining power (low prices), high dependence on subsidies, weak market position, etc. All of these elements decrease farmer's competitiveness and increase vulnerability of their business.

Problem conditions

Lack of funds;
Lack of technical capacities to modernize production methods/agricultural holding;
Lack of willingness to cooperate;
Lack of government support;
Market opportunities (new markets, market expansion, trends, etc);
Development of IT technologies;
Global and regional/local economic and political crisis;
Climate change;

Methodology

Identify possible business strategies;
Analyse each of them using different analytical tools (i.e. SWOT, PESTLE, MECE);
Choose one of them and create business plan;
Discuss within the group and adjust/modify business plan;

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Presentation of full business idea.

Learning outcomes

At the end of the programme, students will be able to describe in details importance of small-scale farmers business, their contribution to the development of sector and overall development of the country. In addition, students need to develop ability to critically assess potential business strategies, choose suitable one and develop business plan for chosen business strategy. Team work, leadership, communication, presentation skills, etc should be developed and upgraded.

Business development

Students need to acquire sufficient knowledge for business development that include using different analytical tools such as SWOT, PESLTE, MECE, etc. that will help them to make decision over possible strategy easier. Business plan preparation is one of the new skills they are going to acquire.

Networking

Students need to understand importance of the networking as a model that increase competitive ability of agricultural producers. Current model of cooperatives in B&H does not allow above mentioned, therefore it is important to learn and promote new cooperative model, that is more market oriented, that stimulate innovativeness between farmers, knowledge exchange and so. Students need to learn about different network channels, role and importance of each.

Innovativeness

Students need to acquire knowledge about new, modern business models, new production techniques that are usually seen as a innovation, learn about diffusion of innovation and how to use innovation capacity to stimulate growth and development of the agricultural and food industry sector.

Agricultural policy

Students need to be aware of current agricultural policy that is in place as well as EU agricultural policy and potentials that they are offering. Farmer's capacity to apply for funds should be taken into the consideration, and what can be done to improve this situation?

Hard skills - 40% in theory (content – knowledge assessment)
Business Planning, Administration & Finances
Project planning
Marketing / Trading
Legal Framework
Communication & Networking
Other
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity

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Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again? What moments you felt proud of your efforts? Could I teach this problem-solving process to someone else easily? Why or why not? What could I do differently from a personal point of view the next time I teamwork? How can you better support and encourage my teammates on future projects? How will you use what you have learned in the future?
Integrative communication of knowledge and skills
Application

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Case study 8.

Sections
Food production systems
Use of technologies and ICT in UA
Urban agriculture entrepreneurship

Student workload
Problem desktop research 16 hours.
Team discussion and analysis 8 hours.
Developing/testing solutions 16 hours.
Analysis 8 hours.

Problem background
WB agriculture has a high share of small agricultural households, especially urban and peri-urban farms. Those farms are characterised with small income input, low technology development and limited resources. Due to the close proximity to urban areas, available space and time are factors influencing farm production.

Problem description
Small agricultural flower producers usually produce flowers in their greenhouses (app. 200 m^2) Since the best market value and the highest demands are for production of annual and biennial flowers, their production is focused on this type of plants. The annual and biennial flowers are produced in the period from January to September. The rest of the year, the greenhouses are not adequately used. The small agricultural producers would like to combine this production with the production of greenhouse vegetables or with the other type of flower production from September to January.

Problem conditions
Small agricultural household has limited funds (1.000 to 2.000 euros) to invest in project for long term solutions only. Work hours should remain same.

Methodology
Propose different production (different vegetables or ornamental plants).
Calculate investments for each production.
Propose new business plan.
Test proposed solutions.
Analyse and discuss proposed solutions
Learning outcomes

Learning outcomes
Students will demonstrate ability to critically research problem, identify available solutions, adapt them to specific situation and conditions, implement and analyse proposed solutions.
Food production systems

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Students will demonstrate knowledge in different plant production, different plant types that demand different growing conditions and can be grown in short cycle. Students will demonstrate ability to plan and implement plant production and to evaluate efficiency.

Use of technologies and ICT in UA

Students will demonstrate knowledge regarding automatisation of plant production as the possibility to reduce farmer's workload and time consumption. Students will demonstrate ability to plan and implement ICT technologies (sensors, etc) in plant production process and to evaluate their efficiency.

Urban agriculture entrepreneurship

Students will demonstrate knowledge regarding business model canvas and value proposition canvas, describe business ideas and write a business plan.

Hard skills - 40% in theory (content – knowledge assessment)
Plant production
Machinery / Engineering
Project planning
Business Planning, Administration & Finances
How to be evaluated: test

Soft skills linked to accuracy in practical
Communication
Self-confidence
Capacity for teamwork
Analytical competence
Creativity
Curiosity
Time management
Flexibility
How to be evaluated:
Evaluation criteria:

Meaningful connections between academic concepts and the experience
Reflection and self-evaluation SELF-REFLECTION QUESTIONS FOR ACTIVE LEARNING What comes to your mind particularly positive? What comes to your mind particularly negative? Can you identify the most relevant discoveries you made in project. Distinguish between what you discovered about: • The topic of investigation • Yourself • The team mates Can you recall your most challenging moments and what made them so thought provoking? What were some of my most influential learning moments and what made them so significant? What is the most important aspect you learned personally? How do you feel that your solution relates to real-world situations and problems? What most got hindered your progress, if anything? How well did you and your team communicate? What were some things your team mates did that helped you to learn or overcome obstacles? How did you assist and support others during this process? Were your milestones and goals mostly met, and how much did you deviate from them if any? What did you learn were your greatest strengths? Your biggest areas for improvement? What would you do differently if you had to approach the same problem again?

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Application

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