

Sustainability Strategy

Consolidated Report

Work Package 5

Elaborated by: Ala Cotelnic (AESM)
Angela Niculiță (SUM)

"This project has been funded with support from the European Commission. The European Commission funding support for this project does not constitute endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

Chisinau/Aalborg, 2019

Executive Summary

This report summarizes the findings, visions and recommendations of the Universities of the Republic of Moldova, members of the project, provided in the reports for the work package 5. The document includes a review of the experience gained in the development and implementation of the pilot study programmes of problem-based learning (PBL), as well as an overview of the universities' visions of ensuring sustainability of student-centred PBL in the institutions.

The report also includes a brief analysis of the roadmaps and action plans proposed by the universities for fully implementing the problem-based learning in pilot study programmes developed during the deployment period of the PBLMD project, but also with a view to extending the PBL at institutional level.

The document in question presents the consolidation of the reports for the work package 5, drawn up by each university and which are annexed to this report.

List of definitions

Problem-based learning (PBL) - student-centered educational strategy, in which the student learns of one or more subjects through the experience of resolving an open problem identified in the source material. The PBL process does not focus on solving problems with a defined solution, but allows the development of other wanted competences and skills. This includes the acquisition of knowledge, collaboration and group communication.

Student-centered learning - teaching and learning process in which the student becomes a partner in the educational process, and the teacher-student relationship is based on cooperation and collaboration.

Self-guided learning is a process in which the student forms independently the values, attitudes, knowledge and skills necessary to make responsible decisions and undertake actions corresponding to his own learning, being cultivated, stimulated, encouraged and favoured by academia, which is flexible, democratic and sensitive to the needs of the student.

Learning objectives – projected learning outcomes, expressed in terms of knowledge, skills, attitudes, values, general competences required for graduates of study programmes by training areas.

Learning outcomes - clear results, describing the knowledge, skills, attitudes of the student, expected from the teaching–learning–assessment process.

Progression – succession of expectations from the teaching-learning process in several stages.

Assessment – a multi-dimensional process of stating learning outcomes; part of the educational process, which reveals the efficiency of teaching and learning.

Project – method/strategy of experiential knowledge, or by investigation, based on solving of tasks/problems, which can be applied individually and in group.

Semester projects – are the projects carried out by students (usually in the group) during a semester. These projects may have inter-disciplinary character (may refer to two or more disciplines studied during the same semester).

Group/team work – the joint work of a group of 4-5 students in carrying out a single task, which is based on communication, collaboration and self-discipline, each member of the group contributing to the achievement of the final result.

Research-based teaching and learning - the process of acquiring knowledge, as well as training or development of skills that are based on tasks that require identification, discovery of information, formulation of solutions through the use of empirical methods, problem solving in order to facilitate the genuine learning process of students (including the individual one).

Sustainability strategy – is a long-term vision of an institution aimed at introducing key modifications in order to streamline the educational process. The strategy includes objectives and concrete actions, the deadline for achievement, as well as the potential outcomes that can be achieved.

(a) the course from a pilot programme to a full problem-based learning (PBL) study programme - concrete steps to introduce problem-based learning in a study programme

(b) supporting and promoting the PBL strategy through information and training activities.

ECTS – European Credit Transfer and Accumulation System (ECTS)

Credit – the credit is a conventional unit used to calculate the amount of work done by the student within a determined period in order to obtain certain competences. The credit is a tool to ensure the quality of the training. The Bachelor's degree studies correspond to 180-240 transferable study credits, 30 credits per semester.

Qualification profile – short document that includes the most essential information about a study programme: purpose, characteristics, employment opportunities, further studies, teaching-learning-assessment strategies, skills and objectives at study programme level.

Professional development of the university staff – opportunities offered to the university staff to strengthen their skills, competences and pedagogical approaches; continuous improvement of staff through trainings, traineeships, etc.

Facilitator – the person who helps a group of students understand their common goals and helps them plan how to achieve the objectives set out in the joint project.

Internship – the work carried out by students in accordance with the educational plan, which aims to capitalise on theoretical knowledge in a real context and facilitate the integration of students into professional life.

Quality assurance – a systematic monitoring and evaluation process of the different aspects of a project to ensure compliance with quality standards.

Table of contents

1	Introduction	7
1.1	Key assumptions.....	7
1.2	Expected outcomes	8
2	Synthesis of Lessons Learned from the Development and Implementation of PBL Pilot Study Programmes.....	9
3	Vision and goals	13
3.1	Destination.....	13
3.2.	Roadmaps	16
3.3.	Action plan	18
4.	Policy recommendations at national and institutional level	26
4.1.	Introduction	26
4.2.	Study programme level	26
4.3.	Department and faculty level.....	27
4.4.	Academic staff level	28
4.5.	Student level	28
4.6.	Pedagogical training level	28
4.7.	Society level	29
4.8.	Administration and management level.....	29
5.	Concluding remarks	31
	References	32

List of tables

Table 1.	University vision on study programmes with PBL application launched in 2017	15
Table 2.	Objectives of the university roadmaps	17
Table 3.	Main objectives and actions specified in the action plans of universities	21

List of figures

Figure 1.	PBL model of the Aalborg University	7
Figure 2.	Socially committed university	8

List of appendixes

Appendix 1.	Report for Work Package 5: AESM	33
Appendix 2.	Report for Work Package 5: SUARB	34

Appendix 3. Report for Work Package 5: SUC.....	35
Appendix 4. Report for Work Package 5: SUMPh.....	36
Appendix 5. Report for Work Package 5: SUM.....	37
Appendix 6. Report for Work Package 5: TUM.....	38

1 INTRODUCTION

The purpose of this report is to make an analysis of the sustainability strategies of the problem-based learning, centered on the student, which were developed by the partner universities in the PBLMD project.

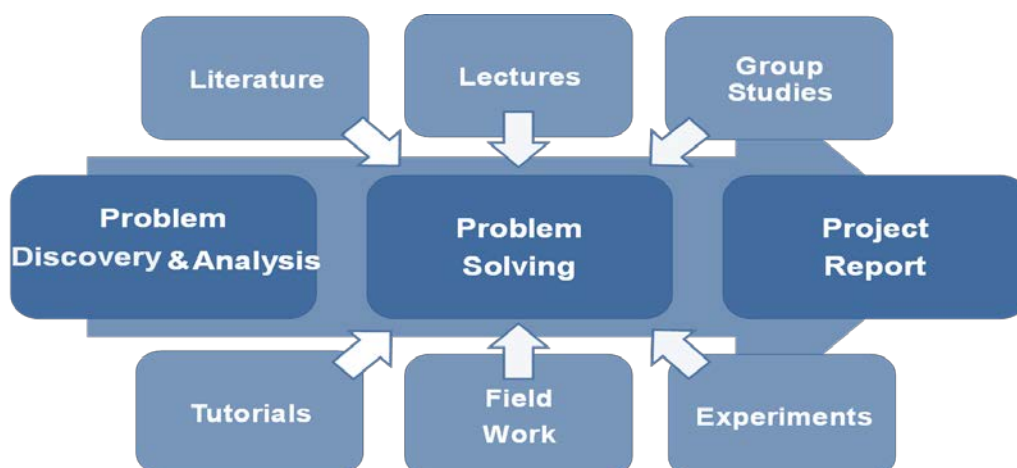
The report contains a review of universities' views on innovative PBL-based study programmes that they have begun to develop, as well as a cross-analysis of roadmaps and action plans that will guide staff and the management of universities in the implementation of the problem-based learning centered on the student in both study programmes and at institutional level.

When developing their sustainability strategies, roadmaps and action plans, universities based on the results of work packages 2-4, implemented during the years 2015-2017, which materialised in launching six pilot study programmes based on PBL. Universities also used the experience gained during study visits and the mobility of academic staff at EU partner universities, as well as during the PBL training sessions offered by the EU project partners in Moldova.

1.1 KEY ASSUMPTIONS

There is no problem-based learning (PBL) model suitable for all purposes, for all areas of professional training. However, PBL models are based on two key assumptions. The first assumption is that the teaching-learning process must be centered on the student and designed to equip students with knowledge, understanding and the ability to implement their knowledge and understanding. For this purpose, PBL is focused on the project work, the study activity including the identification, analysis and solving of the problems, as well as the report on the project carried out. An example of such an approach is the model of the Aalborg University (Figure 1).

Figure 1. PBL model of the Aalborg University



The second assumption assumes that the other teaching and learning (face-to-face) activities, such as working with literature, lectures, group studies and tutorials, are designed to support the work on the project.

The degree of implementation of the problem-based learning in the study programme is reflected in the relationship between project work and traditional teaching-learning/face-to-face activities (such as lectures, seminars, laboratories, experiments). Universities started from the Aalborg University (AAU) model, in which a “fully developed” study programme based on PBL means a study programme in which this ratio is approximately 50:50.

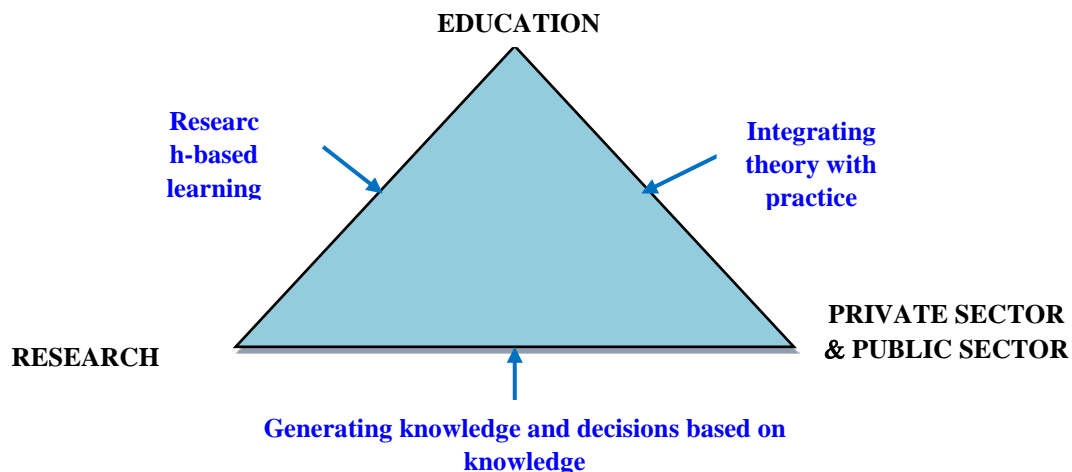
These two assumptions and the AAU approach to PBL are the basis for innovative study programmes, based on the active teaching-learning, problem-based, student-centered learning, which were proposed by the partner universities in the work package 5.

1.2 EXPECTED OUTCOMES

In their roadmaps and action plans, universities envisage a series of results that they aim to achieve. Thus, at least six study programmes of the universities, partners in the PBLMD project, are expected to be redesigned in accordance with problem-based learning, with the methodologies and active teaching-learning methods centered on the student by the year 2022, and starting with 1 September 2022, potential students will be able to register for these programmes. Similarly, a better adjustment of the knowledge, competences and skills of the students to the needs of the labour market is expected.

The successful implementation of innovative PBL study programmes, as well as its institutional enlargement effects, will contribute to the development and consolidation of the process of integrating education, research and the real sector (Figure 2).

Figure 2: Socially committed university. Source: Olav J. Sorensen, 2015



2 SYNTHESIS OF LESSONS LEARNED FROM THE DEVELOPMENT AND IMPLEMENTATION OF PBL PILOT STUDY PROGRAMMES

By conducting an analysis of the reports for the work package 5 developed by universities, we further present a summary of the reflections of the members of the teams of the PBLMD project on the development process and the results of the implementation of the pilot study programmes with the use of PBL, mentioning the constraints and problems faced.

Rethinking the educational plan

I. In the process of elaboration/adaptation of the educational plans to the PBL method, which, in their full (integral) variant, implies the establishment of a ratio of 50 to 50 between the lectures/seminars and project hours, an impediment that was found are the restrictions in the existing framework plan. Thus, this document for the elaboration of the educational plans provides for the compulsory inclusion of the *course units for the training of general skills and competences* - between 9 and 18 credits, and *the socio-humanistic ones* - between 9 and 18 credits. In this context, the compulsory inclusion of course units that do not develop the specific professional skills, even on the minimum limit - 18 ECTS, constitutes 10% of the total number of credits of the study programme, which leads to the natural exclusion of the course units inherent in the formation of the future specialist.

Another restriction of the framework plan consists in “allocating maximum 4-6 study credits for a module”, which does not allow the *project* to be allocated with a higher number of credits, and in this regard, nor diminishing the number of course units for one semester.

II. PBL-based pilot study programmes provide that in each semester students must develop a group project. In this context, it would be necessary to transfer a number of lecture hours to supervision hours. Teamwork requires from the teacher a particular involvement from this perspective.

III. During the implementation of the PBL-based pilot programmes, it was identified the need to introduce a module on *Academic writing and research methodology*, with students being familiarized with the research methods, the way of structuring the papers, the use of bibliographical sources, the rigors of the independent study avoiding plagiarising, etc.

Interdisciplinary approach

The interdisciplinary approach is one of the prerequisites for achieving the problem-based learning process. In the pilot programmes, modules were carried out which merged two courses and provided for an interdisciplinary project. At TUM, semester structuring was achieved on study themes, with dedicated disciplines and interdisciplinary projects.

In the process, difficulties were encountered in formulating interdisciplinary problems with the application of research methodologies. Interdisciplinary projects led to a collaboration between teachers of the disciplines in the same module/semester with the formulation of joint themes or problems.

Multidisciplinary study requires more intensive collaboration between teachers, so it is necessary to have a manager (responsible) of the programme, which would coordinate the work of teachers, taking into account the theme of the semester, learning objectives and outcomes, student workload, etc.

Elaboration of methodical support and case studies for students

The academic staff that implemented the pilot PBL programmes mentioned the need to develop a methodical guide on the elaboration and defense of PBL projects.

An important aspect of the PBL relates to the definition of complex and real problems. Even if students have some experience in developing the project, they focus largely on the study and development of the subject, encountering difficulties in defining the problem and resolving it. Following the survey conducted among students, they noted that they encountered the greatest difficulties at the stage of identifying the problem and organizing the activity within the team.

It is also welcome and necessary to elaborate case studies/simulations that would constitute a support for teachers and motivate students to identify certain problems more easily and to look for real solutions to existing problems.

Changing the teacher's role

PBL requires another approach to the teacher's role in the teaching – learning process, thus becoming a facilitator who guides and supervises the work of students. At the same time, in order to maintain the expert position, teachers must be open to lifelong learning, adjust their working methods, activities to the rigors of the time.

Thus, the application of the PBL requires the teacher to rethink the methods of presentation of the study material, the organisation of training activities, but also the method of assessment. As a result, the student becomes more confident in his own forces, more eager to argue and reflect critically on various problems.

In this respect, it is necessary to give interested teachers the possibility of training on the problem-based learning method – PBL.

Group work

During the implementation of the pilot programmes, several methods were tried to train teams for group work on various tasks and project: random formation, formation at the free choice of students; formation of teams by the teacher responsible for the project. Along the way there was found: the lack or insufficiency of group work competences, the desire to work in a group with only certain colleagues, interpersonal conflicts involving each other in the elaboration of the project, as well as related to the distribution of roles in the group, lack of interpersonal communication skills and reduced accountability for decision making, non-compliance with the deadlines imposed by team members for carrying out tasks.

In order to overcome the challenges outlined, a series of measures on students' empowerment were undertaken, including: meetings of the supervisor with the work group, in which the supervisors explained to the teams that the final product and team performance is directly proportional to the sum of individual performances; monitoring the progress of the project by the supervisor and introducing the interim assessment of the project.

Monitoring the project development process

At the beginning of the implementation of the pilot study programmes, difficulties were encountered with regard to the establishment of the project supervisor's tasks and conduct of the project monitoring.

Based on the experience gained from work visits to partner universities, ways of monitoring the project development process have been established, which involve set thematic weekly meetings of students with the supervisor and communication with the supervisor through the Moodle platform and by means of cooperative e-mail. In turn, the supervisor's role is to guide students and monitor the process of project development according to the objectives specified in the curriculum.

Changing the knowledge assessment method

A sensitive aspect in the implementation of the PBL is related to the correct assessment of students, taking into account the fact that when carrying out a series of tasks and projects they work in groups/teams.

The problem encountered when assessing a team was to identify the contribution of each member's involvement in achieving the project. During the deployment of the pilot study programmes, different types of team assessment were tested: group assessment, individual assessment, peer review, team assessment by representatives of the private sector.

It was found that the objective assessment was achieved when taken into account: both group and individual assessment, and peer-review.

A questionnaire has been compiled that is offered to team members when assessing the project to reflect on the contribution of each team member.

Collaboration with the business environment

The PBL method implies a close cooperation with stakeholders both at the stage of the elaboration of the educational plan/curriculum, but also at the stage of the formulation of problems and real current tasks for projects and assessment of the student work. This work can be accomplished through the organisation of round tables, joint conferences, student study visits and internships in the respective institutions.

Unfortunately, during the implementation of pilot programmes, there was a low interest of stakeholders to work with academia in the initiation and work on projects, to be involved in the elaboration of educational plans and curricula. Even though universities have signed several cooperation agreements with economic agents, they refer, in particular, to providing places for students' internships.

Most often stakeholders are willing to provide answers to students' questions, but not to provide concrete data/reports needed to implement projects, explaining this refusal by trade secret.

The development of a mutually beneficial collaboration with stakeholders would allow teachers to develop case studies and to formulate problems in the real environment, i.e. students could benefit from information for designing problems and developing projects. In turn, companies would benefit from new ideas that would give them the opportunity to solve certain problems they face.

Preparing the teaching infrastructure based on PBL methodology

The PBL teaching methodology cannot be performed on the full without a well-formed infrastructure. This implies: the existence of several halls and workspaces, where teams can have free access for teamwork; equipping of rooms with ICT equipment; the existence of specialised communication environments such as the Moodle platform, or corporate email; the literature supply of libraries.

3 VISION AND GOALS

3.1 DESTINATION

Most of the six universities in the consortium, following the study of student-centered teaching methods in several universities in the European Union, and taking into account the experience gained during the implementation of the PBLMD project, propose amplification of the use of PBL at the level of the programme selected for the project, but also its extension for other study programmes in the institutional offer.

The purpose of each programme is the formation of specialists with multiple theoretical and applicative competences in the field, which will facilitate the integration of future graduates into the labour market.

When developing new educational plans, using PBL, universities were led by the provisions of normative acts in the Republic of Moldova:

- The National Qualifications Framework, which ensures national recognition, as well as the compatibility and comparability at international level of qualifications acquired in the higher education system. Through it, there are recognized, measured and connected all the learning outcomes obtained in higher education institutions.
- Framework Plan for higher education, which is part of the state educational standards in higher education, establishes the general principles for organising and conducting the study process in higher education institutions, reflects the basic requirements for the elaboration of educational plans in different fields of professional training/specialties, master's degree programmes, doctoral degree programs.

To implement PBL-based learning, universities will create an appropriate, qualitative and productive educational environment, centered on the student, which will be characterized by the following characteristics:

- Creating an authentic learning environment close to the real sector and relevant to the student's interests in achieving the projected objectives; acquisition of knowledge, training of skills and personal and professional competences;
- Merging theoretical aspects with the cultivation of skills related to the realities of activities in the appropriate field;
- Structuring the educational approaches on the concept of "problem-based learning" and the development of practical dexterities;
- Ensuring the conditions for facilitating access, progress in the university career and the mobility of students and graduates in the European area.

At the same time, the consortium came up with some proposals to extend the autonomy of universities in establishing the structure of the educational plan and its constituent elements. Starting with the possibility of extending freedom in this regard, each university developed educational plans, which would allow for more complete integration of the PBL principles. The vision of each university on the educational plan for the selected programme is presented in its report drawn up in the work

package 5. In table 1 we present the main elements, called indicators, which characterize the vision of universities on selected study programmes.

As we note, the level of implementation of the problem/project-based learning (PBL) is, in most cases, the institutional one. This means that for the period 2019-2022, universities (AESM, SUARB, SUC, SUM, TUM) are geared towards extending PBL to other study programmes, not only the pilot ones. TUM will continue to focus on *Software engineering* programme, and the SUMPh, which within the project implemented PBL in the *Neuroscience* pilot discipline (part of the *Public health* programme), will expand this teaching-learning method to *Optometry* study programme.

The ***PBL learning: traditional forms of learning*** ratio that the universities of AESM, SUC, TUM are planning are the same as in the PBL model at the Aalborg University, i.e. 50:50. SUARB and SUM are planning this ratio of 45 to 55 percent, and SUMPh - 35 to 65.

The knowledge assessment methods are almost identical for all universities. There are provided oral, in writing and computer aided assessments, group and individual assessments of projects, peer review. The involvement of the external assessors in the student assessment process is provided by the SUM.

For the initiation of students in terms of PBL, AESM, SUC and SUMPh provide for the introduction of a particular discipline with a different number of ECTS, in the first semester of the study year. The SUARB plans an interdisciplinary project in the first semester under the name of “Research methodology in PBL”, to which 8 ECTS will be allocated.

The SUM proposes the introduction, in the year 2020, of the discipline “*Academic writing and research*”, which aims to train students with reference to the methodology of research and writing of study works, projects, theses, articles.

In the visions of their study programmes, which they presented, all universities (excluding the SUMPh) structured the educational plan on semester themes according to which the disciplines and projects are included, to be achieved during the study period. The SUMPh provided for this only for semesters V and VI.

All universities in the consortium foresee the expansion of PBL: AESM, SUC, SUARB and SUM – at institutional level, i.e. for other various study programmes, including at Master’s degree level, and the SUMPh and TUM – for some concrete programmes.

Extending PBL at the level of various programmes implies the involvement of an increasing number of teachers. This determines the need for continuous training of academics. All universities provide for the organisation of continuous training for teachers throughout the whole period.

Table 1. University vision on study programmes with PBL application launched in 2017

Universities	SAEM	SUARB	SUC	SUM	SUMPh	TUM
Indicators						
PBL implementation level	Institutional	Institutional	Institutional	Institutional	Study programme	Institutional
PBL: Traditional forms of learning ration	50:50	45:55	50:50	45:55	35:65	50:50
Methods to assess knowledge, including the presence of external assessors	Exam (written, oral, computer aided), group and individual assessment of projects	Exam (written, oral, computer aided, individual and group assessment, peer review)	Exam (written, oral, computer aided), group and individual assessment of projects	Examination, testing, assessment of the group and individual project. External assessor – where applicable	Tests, exam (oral, written)	Exam, project assessment.
Initiation into PBL and group work (initiation course)	Discipline Introduction in problem-based learning	Interdisciplinary project Sem. I: Research methodology in PBL – 8 ECTS	“Learning by problem research (PBL – Problem Based Learning)”- separate discipline	-	Discipline “Introduction into problem-based learning, communication and medical practice” – 10 ECTS	-
Introduction of the writing and academic research course				Planned in year 2020		
Structuring the programme on semester themes	Existent	Existent	Existent	Existent	Planned for semesters V and VI	Existent
Extension of PBL	It is planned for different study programmes	It is planned for different study programmes	It is planned for different study programmes	It is planned for different study programmes	It is planned for different study programmes	It is planned at programme level
PBL training for academic staff	It is planned for the whole period	It is planned for the whole period	It is planned for the whole period	It is planned for the whole period	It is planned for the whole period	It is planned for the whole period

3.2. ROADMAPS

In order to ensure the sustainability of problem-based learning – PBL, each university has developed its roadmap. This includes several activities necessary to be implemented at institutional and programme level in order to achieve the objective put forward. To mention that the realization of the roadmaps has already begun, some activities being completed, others are in full swing or are to be implemented in the coming period.

In order to ensure the quality of teaching, a number of objectives have been identified that will be achieved through the implementation of several activities: continuous teacher training, consultation of employers and their involvement in teaching activities, consultation and guidance/coordination of internships, conducting surveys to get feed-back from students. It is also envisaged to consult the opinion of employers through questionnaires on conducting student internships and their level of preparedness for the activity in question.

In Table 2 all activities planned by universities are divided into groups oriented towards the achievement of the objectives formulated. These objectives will be achieved during certain time periods. The entire period of implementation of the roadmaps is 2019-2022, being structured on semesters.

Each university has formulated its objectives, presented in the work package 5 reports. Even if they are generically not exactly identical, their essence, in many cases, is almost the same. This has facilitated our emphasis on the objectives specified in Table 2.

Thus, all universities provide for *the connection of the study programme to good PBL practices of European universities and of their own experience* (pilot programmes). Since 2017 the universities have implemented PBL in the pilot programmes, which has allowed to accumulate their own experience. There have been and there are still found some good aspects, which need to be expanded or deepened, as well as some shortcomings, deficiencies or even problems that have emerged along the way. Obviously, they must be resolved, or, where possible, eliminated. This connection will be made during the whole period, periodically analyzing the progress of things.

The implementation of PBL is impossible without a *well-prepared infrastructure*. Although the universities within the project have arranged several dedicated halls for PBL lessons, in the case of extending this learning method, which is provided for by universities, it is necessary to continuously adapt the university infrastructure to PBL specifics. All universities aim to *develop the educational infrastructure dedicated to PBL*. This also includes the development of information resources by acquiring the bibliographical sources required for PBL learning.

We consider it important to ensure the continuity of training under the PBL, which is why universities aim to *further promote programmes in which training is carried out on the basis of PBL*. For this purpose, advertising materials will be prepared, various dissemination events will be organised, and other methods will be implemented to help promote PBL study programmes.

Table 2. Objectives of the university roadmaps

Objectives	Implementation period (month, year)							
	01-06. 2019	07.-12. 2019	01.-06. 2020	07.-12. 2020	01.-06. 2021	07.-12. 2021	01.-06. 2022	07.-12. 2022
Connection of the study programme to good PBL of European universities and of their own experience (pilot programmes).	AESM SUC SUM SUARB SUMPH TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM TUM	AESM SUC SUM TUM	AESM SUC SUM TUM	AESM SUC SUM TUM		
Development of educational infrastructure dedicated to PBL	AESM SUM	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB
Promoting PBL-based study programmes	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM
Collaboration with stakeholders (employers, graduates, etc.)	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM
Training and continuous development of PBL teaching staff	AESM SUC SUM SUMPH	AESM SUC SUM	AESM SUC SUM SUARB	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM	AESM SUC SUM SUARB TUM
Extension of PBL to other study programmes in universities	AESM SUC SUM	AESM SUC SUM	AESM SUC SUM SUARB	AESM SUC SUM SUARB SUMPH	AESM SUC SUM SUARB SUMPH	AESM SUC SUM SUARB	AESM SUC SUM SUARB	AESM SUC SUM SUARB
International evaluation and accreditation of the programme						SUMPH		
Internationalisation of the study programme			TUM	TUM	TUM	TUM		
Introduction of the discipline Academic writing and research at Bachelor and Master's degree level		SUM	SUM	SUM				

The achievement of effective training under the PBL is possible only if universities manage to establish collaborative relations with the main stakeholders: employers, economic agents, public administration, NGO representatives, etc. Agreements between universities and the real sector must provide for internships, the involvement of stakeholders as experts in the development of educational plans and curricula, the contribution to the identification and formulation of the problem for project development, participation as external assessors in exams and project defences. Universities are planning closer relations with graduates as potential employers. These activities are planned for the entire period concerned.

In order to succeed in the successful implementation of the PBL an important role rests with the well-trained teaching staff, familiar with PBL-based training. *The training and continuous development of teachers* is a goal stated by each university, virtually for the entire period of the roadmap.

The positive effects universities noticed following the implementation of PBL led them to *extend* this experience to other study programmes. They differ only in times when universities will achieve this expansion. Thus, some universities - AESM and SUC - plan for gradual enlargement during the whole period concerned. Other universities have drawn up more concrete periods of enlargement mentioned in Table 2.

The international evaluation and accreditation of the programme is provided only by the SUMPH. This university, in the PBLMD project, has implemented PBL at the Neuroscience discipline for the Public Health Bachelor's degree programme. In the roadmap of the SUMPH, it is foreseen the extension for a new programme – Optometry, which by the end of the first promotion – year 2021 is to be subjected to international evaluation and accreditation.

The internationalisation of the study programme as a separate objective was mentioned only by TUM, but through the actions they promote, all universities plan certain internationalisation activities (*academic mobility*, attracting in the programme as visiting professor or for co-teaching of teachers from international universities promoting PBL, *continuous analysis and implementation of good practices in international universities, promoters of the PBL, etc.*).

The introduction of the discipline of *Academic writing and research* at the Bachelor and Master's degree level is an objective, which in the reference period, is provided only by the SUM, although that course is a useful one, which is meant to teach students how to do research and how to present it in written form.

3.3. ACTION PLAN

The action plan is intended to materialize in specific actions, for the periods set, the objectives outlined in the abovementioned roadmaps. Once again, the realisation of these actions requires various resources: financial, material, human, time, etc. In the reports drawn up within the work package 5 universities mentioned the concrete actions to be achieved. In Table 3 we will present a synthesis of the most important or most frequently found activities mentioned by most universities.

We note that the measures taken under the PBLMD project on the procurement of equipment required for the application of the PBL methodology, the experience gained by teachers in mobility,

have enabled us to perform various dissemination activities and organise workshops for teachers and students.

However, with a view to strengthening PBL culture in universities, as well as for the operation of changes in educational plans and conducting studies in projected visionary programmes, actions to reconceptualise the University curricula will be performed, practical strategies – an important part of the study process, of the preparation of didactic materials in line with the PBL approach, as well as actions to analyse the satisfaction of students and academic staff on group work on projects, etc.

All these require various resources; which we will mention in the way they were determined by the universities.

Human resources. These resources include representatives of higher university management, responsible for implementing PBL culture at institutional level; interested academic staff, co-opted for extending PBL for various study programmes; collaborators of structures responsible for pedagogical/continuous training of academics and, in particular, *members of the PBLMD project's implementation teams.*

Material resources. In order to achieve the action plan, it will require suitable IT equipment for PBL, consumables and spaces for discussion, group work and other accompanying activities. All this will be made available by universities in the volume and structure corresponding to the needs of each institution.

Information resources. These resources can be accessed from open sources on the Internet, by subscribing to various databases, as well as by acquiring didactic and research materials for university libraries.

Time resources. All activities foreseen in the action plans will be carried out outside basic hours, where teachers have lessons with students, perform research or administrative activities. It will be used, in case of necessity, the free time to complete certain activities on time.

Financial resources. Universities will allocate the necessary financial resources to ensure the PBL teaching-learning process with IT equipment, quality Internet access, consumables, with spaces required for specific PBL activities, as well as for the training of academic staff, dissemination activities, etc.

We will mention the following actions, and the allocation for periods can be seen in Table 3.

I. Connection of the study programme to good PBL practices of European universities and of their own experience (pilot programmes).

- Monitoring, improvement and revision of the pilot study programme;
- Coverage of educational disciplines with necessary didactic materials, methodological materials for teaching-learning-assessment
- Review of the curriculum on disciplines, sheets on disciplines, case studies.
- Enhancing the international compatibility of PBL study programmes
- Participation in international projects of academic mobility. Academic exchange under bilateral agreements.
- Providing English language courses for teachers.

II. Development of educational infrastructure dedicated to PBL

- Adaptation of spaces for teaching based on PBL methodology
- Diversifying the information resources needed to ensure students' access to information and knowledge needed to develop projects;

III. Promoting PBL-based study programmes

- Elaboration of informative materials (information leaflets, periodical publications, audio, video spots) for PBL programmes

IV. Collaboration with stakeholders (employers, graduates, etc.)

- Consultation and endorsement of new educational plans with the business environment regarding the correlation of the objectives with the skills required in the labour market
- Attracting employers to participate as external assessors of group work, projects and the formulation of problems foreseen for research in projects
- Attracting companies, including international ones, for knowledge transfer support at the level of content, teachers and student internships.
- Development of research-oriented scientific partnerships with other universities, institutions.

V. Training, continuous development and motivation of PBL teachers

- Ensuring institutional support to subdivisions providing PBL training
- Designation and training of the semester responsible, project tutors, etc.
- Elaboration of methodical support for PBL for teachers
- Training of the team of trainers/teachers that will provide the courses of the continuous training programme
- Organising the continuing training of teachers, including on PBL
- Launching a national and institutional scholarship competition for teachers applying PBL
- Adjusting the rules on workload and providing performance enhancement incentives for teachers applying the PBL methodology

VI. Extension of the PBL practice to other study programmes in universities

- Extending the pilot programme to other disciplines or other Bachelor's degree programmes
- Promoting good PBL practices
- Elaboration of educational plans for new programmes with PBL learning
- Implementation of PBL for new programs
- Periodic evaluation of the implementation of the PBL methodology

VII. International evaluation and accreditation of the programme

- Preparation of all documents necessary for the international accreditation of the PBL study programme
- Initiation of the international accreditation procedure

Tabelul 3. Main objectives and actions specified in the action plans of universities.

Objectives	Actions	Implementation period (month, year)							
		01-06. 2019	07.-12. 2019	01.-06. 2020	07.-12. 2020	01.-06. 2021	07.-12. 2021	01.-06. 2022	07.-12. 2022
Connection of the study programme to good PBL practices of European universities and of their own experience (pilot programmes).	Monitoring, improvement and revision of the pilot study programme	SUC SUARB	AESM SUC SUM	AESM SUC SUMPH	AESM SUC	AESM SUC	AESM SUC	AESM SUC	AESM SUC
	Coverage of educational disciplines with necessary didactic materials, methodological materials for teaching-learning-assessment	AESM SUM SUMPH	AESM SUC SUM SUMPH	AESM SUC	AESM			SUC	
	Review of the curriculum on disciplines, sheets on disciplines, case studies.	SUM TUM SUMPH	SUM SUARB	SUC		SUC	AESM	AESM	
	Enhancing the international compatibility of PBL study programmes	TUM	TUM	TUM	TUM	SUC TUM	TUM	TUM	TUM
	Participation in international projects of academic mobility. Academic exchange under bilateral agreements	AESM TUM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	SUM SUARB TUM
	Providing English language courses for teachers.	AESM TUM	AESM TUM	TUM	TUM	TUM	TUM	TUM	TUM
Development of educational infrastructure dedicated to PBL	Adaptation of spaces for teaching based on PBL methodology.		AESM TUM	TUM	AESM SUARB TUM	SUARB TUM	AESM SUARB	SUARB	SUARB
	Diversifying the information resources needed to ensure students' access to information and knowledge needed to develop projects;	AESM SUM	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB	AESM SUM SUARB

Promoting PBL-based study programmes	Elaboration of informative materials (information leaflets, periodical publications, audio, video spots) for PBL programmes	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM	AESM SUM TUM
Collaboration with stakeholders (employers, graduates, etc.)	Consultation and endorsement of new educational plans with the business environment regarding the correlation of the objectives with the skills required in the labour market	AESM SUM SUARB	SUM SUARB	AESM SUM	SUM SUARB	AESM SUM	SUM SUARB	AESM SUM	SUM
	Attracting employers to participate as external assessors of group work, projects and the formulation of problems foreseen for research in projects	SUARB	SUARB	SUM SUARB	SUM SUARB	SUM SUARB	SUC SUM SUARB	SUM SUARB	SUM SUARB
	Attracting companies, including international ones, for knowledge transfer support at the level of content, teachers and student internships.	AESM SUC SUM TUM	AESM SUC SUM TUM	AESM SUC SUM	AESM SUC SUM	AESM SUC SUM	AESM SUC SUM	AESM SUC SUM	AESM SUC SUM
	Development of research-oriented scientific partnerships with other universities, institutions.	TUM	TUM						
Training, continuous development and motivation of PBL teachers	Providing institutional support to subdivisions providing PBL training	AESM SUC SUM	AESM SUM SUARB	AESM SUM SUARB	AESM SUM	AESM SUM	AESM SUM	SUM	SUM
	Designation and training of the semester responsible, project tutors, etc.		AESM	SUC					

	Elaboration of methodical support for PBL for teachers	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM		AESM	
	Training of the team of trainers/teachers that will provide the courses of the continuous training programme	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH						
	Organising the continuing training of teachers, including on PBL		AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH
	Launching a national and institutional scholarship competition for teachers applying PBL							SUM	SUM
	Adjusting the rules on workload and performance enhancement incentives for teachers applying the PBL methodology	SUARB	SUARB						
Extension of the PBL practice to other university study programmes	Extending the pilot programme to other disciplines or other Bachelor's degree programmes			SUM SUMPH	SUM	AESM SUM	SUARB		
	Promoting good PBL practices		AESM SUM TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM	AESM SUM SUARB TUM
	Elaboration of educational plans for new PBL programmes	TUM SUMPH	SUM TUM	SUM	AESM SUM	SUARB	SUC		AESM
	Implementation of PBL for new programmes			TUM SUMPH	SUM	SUM	SUM SUARB	SUC	AESM

	Periodic evaluation of the implementation of the PBL methodology	SUC TUM	SUC SUM SUARB TUM	SUC TUM	AESM SUC SUM SUARB TUM	SUC TUM	AESM SUC SUM SUARB TUM	SUC TUM	SUC SUM SUARB TUM
International evaluation and accreditation of the programme	Preparation of all documents necessary for the international accreditation of the PBL study programme					SUMPH			
	Initiation of the international accreditation procedure						SUMPH		
Internationalisation of the PBL study programme	Cooperation and partnership activities based on international projects with universities abroad	TUM	TUM	SUM TUM	TUM	AESM TUM	TUM	AESM TUM	TUM
	Attracting international teachers to teach courses							TUM	TUM
	Conducting international academic mobilities	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH	AESM SUC SUM SUARB TUM SUMPH
	Providing PBL study programmes in English						AESM	AESM	AESM
Introduction of the discipline <i>Academic writing and research</i> at Bachelor and Master's degree level	Elaboration of the curriculum and course support for the discipline of <i>Academic writing and research</i>		SUM						
	Introduction into the educational plan and ensuring the teaching of the course <i>Academic writing and research</i>			SUM					

VIII. Internationalisation of the PBL study programme

- Cooperation and partnership activities based on international projects with universities abroad
- Attracting international teachers teach courses
- Conducting international academic mobilities
- Providing PBL study programmes in English

IX. Introduction of the discipline *Academic writing and research* at Bachelor and Master's degree level

- Elaboration of the curriculum and course support in the discipline of *Academic writing and research*
- Introduction into the educational plan and ensuring the teaching of the course *Academic writing and research*

From Table 3 we can deduce that some actions are identical or similar to all or most universities. This seems absolutely natural to us, given that the aim and activities promoted during the implementation of the PBLMD project were similar. At the same time, the SUMPH aims at international accreditation of the new Bachelor's degree study programme – Optometry, and the SUM - to develop and introduce the discipline “Academic writing and research”.

4. POLICY RECOMMENDATIONS AT NATIONAL AND INSTITUTIONAL LEVEL

4.1. INTRODUCTION

The recommended policies take into account all parties involved in ensuring quality education through the implementation of the PBL - university, students, teachers, economic agents.

With reference to *students*, in order to facilitate employment, *they* must acquire the skills, knowledge and transferable competences required by the real sector.

In this regard, universities are proposing to modernise their study programmes, teaching materials and student assessment systems. To improve quality, ensure relevance and increase the number of students, flexible and innovative methods and approaches are needed. An essential moment is to exploit the advantages of information and communication technology (ICT) and other new technologies in order to enrich the teaching-learning process, improve learning experiences and support the PBL, so that each student can benefit from high-quality education.

The reform and modernisation of higher education depends on the competence and motivation of *academic staff* – teachers and researchers. In this respect, it is necessary to ensure better working conditions, the implementation of transparent and equitable recruitment procedures, continuous professional development at a higher level and better recognition and rewarding of excellence in teaching and research.

Theoretical training in the training of a specialist is important, but we believe that it needs to be complemented with relevant and effective practical activities. Without these practical activities, the theory cannot be assimilated correctly, nor can it be useful for students, future professionals. In this respect, we believe that one of the key actions in ensuring the quality and relevance of higher education is *to improve relations between universities and the economic environment and to develop a much closer, mutually advantageous cooperation.*

The recommended policies below come in full compliance with the ones presented above.

4.2. STUDY PROGRAMME LEVEL

At the study programme level, universities come up with the following recommendations:

- Developing new educational plans for selected study programmes, taking into account the specifics of the PBL method.
- Review/elaboration of the curricula for each discipline, included in these educational plans. The continuous adaptation of the study programmes and the contents of the course units to the needs of students and society.
- Inclusion in the educational plan, beginning in the first semester, of the discipline *Introduction into PBL*, which would form the basic skills in organizing and implementing teamwork based on project/problem;

- Providing students with methodical and didactic material: through the Moodle platform, printed works.
- Creation of the system for the collection of feedback of students and graduates on the quality of the study programme.
- Elaboration of a guide for students, which would facilitate the activities of the formulation of the problem and the group development of the project.
- Introduction of the discipline of *Academic writing and research*;
- Encouraging and stimulating the use of ICT technologies in the educational process.
- Integrating the research aspect into the teaching-learning process.
- Appointment of mentors, who will handle the monitoring of work on the project(s), follow-up and conclusion of the evaluation of the activities in the projects of students and teachers (assessment of students, teachers).

4.3. DEPARTMENT AND FACULTY LEVEL

At the department level:

- The departments are responsible for employment and promoting academic staff according to the performances achieved.
- The departments, in line with other institutional structures, are responsible for establishing the appropriate way of communicating and collaborating with stakeholders in order to adjust the educational plans to the labour market requirements, identify problems which economic agents face to be investigated/resolved within projects, Bachelor's, Master's or Doctoral degree theses, as well as students suitable for recruitment; organise laboratories and training centres to be used together by the university and interested economic agents.
- To create the research group for the development and improvement of PBL-based teaching, which will investigate the specifics of the PBL application process, taking into account the particularities of the disciplines.
- Active involvement in the continuous training of academic staff and increasing the number of staff with scientific degrees and science-didactic titles.
- Periodic monitoring and analysis of PBL application in the teaching-learning process.

At the faculty level:

- Faculties have to ensure greater flexibility in setting schedules for practical lessons and optimise the use of study rooms, equipped for PBL.
- Based on the experience of the Aalborg University, it is welcome to appoint a semester coordinator from among experienced teachers who teach courses in that semester. Their role is to coordinate the work of all academic staff that provides the teaching-learning process in the respective semester, to communicate with students about learning experiences, to consult them on the educational path, etc.
- Promoting good practice of implementing PBL in the faculty/university.
- Organizing campaigns to promote academic mobilities with the involvement of Erasmus+ students and academics and the dissemination of their experience.

4.4. ACADEMIC STAFF LEVEL

- Ensuring the regular training of academic staff on the application of the PBL method.
- Stimulating academic staff for the study and application of PBL in the teaching-learning process.
- Providing support through various methods of academic staff in order to implement lifelong learning and participation in academic mobility programmes.
- Establishing as an academic promotion criterion the high-level knowledge of an international language.
- Promoting a performance-based payroll system.
- Organizing at least once a year *team building activities by departments/faculties* outside the institution because they have proven to be the most effective forms of training.

4.5. STUDENT LEVEL

- Active involvement of students in the process of accumulation of knowledge and development of communication skills, group work, etc., in response to new modern approaches and techniques in the teaching-learning process, which calls for problem solving/development of projects. Engaging students in promoting good PBL practices.
- Students of the year II and III will share experience in applying PBL to students of the year I.
- Student involvement in peer review.
- Ensuring a feedback from students on the quality of teaching on the basis of PBL throughout the studies.
- Create a *Student Support Center* to facilitate the integration of first-year students into the university community by organising different activities of mutual knowledge of students, planning the educational path, time management, professional career development, etc.
- Active participation of students in academic mobility programmes.

4.6. PEDAGOGICAL TRAINING LEVEL

- Creation/designation of a subdivision (at institutional level) responsible for pedagogical training of academic staff, including on PBL.
- Organizing pedagogical training programmes for academics in universities.
- Elaboration of a series of guidelines/methodologies/procedures on the principles of training the work group on the problem/project, which would provide the possibility to avoid critical or deadlock situations that may arise in the given process.
- Elaboration of a guide for students and academic staff on the principles and rules of defence/examination of the project, time allotted for presentation and examination, examination criteria, etc.
- Establishing a collaboration between universities implementing study programmes with the application of the PBL, on the periodic organisation of the exchange of experience.

Thus, good practice will be shared in the implementation of the PBL method, problems will be traced and solutions will be sought jointly.

- Launching an institutional and national scholarship competition for academic staff applying PBL.
- Creating a methodological support platform in PBL for students.

4.7. SOCIETY LEVEL

An important role in the elaboration/improvement of study programmes and curricula is given to employers and graduates, who are consulted in the process of drafting and reviewing them (the form of expertise), in organizing the in production and Bachelor's degree internship (the form of the appropriate agreements), the elaboration of the theses and during the period of defence of the Bachelor's degree exam (formulation of the theme of the Bachelor's degree theses and examination problems) (participatory form), etc. In this context, the following recommendations have been made:

- Working with business, NGOs, public administration for the purpose of identifying subjects that could be tackled and developed under PBL-based study programmes.
- Involvement of practitioners in the process of teaching courses and assessment of projects.
- Inviting stakeholders to formulate project problems and assess the results of student work on these projects.
- Organizing workshops with the participation of the representatives of the business environment/real sector in order to determine their requests and needs.
- Establishing collaboration agreements with various institutions/businesses, which would be open to provide information to students for work on projects. Creation of bi-/tripartite partnerships with mutual benefits: students will have the opportunity to investigate real case studies, solve real problems, based on truthful data, and businesses and organisations will obtain from students new ideas, calculations and solutions for existing problems.
- The creation of professional associations in order to involve practitioners, prospective employers and even students or graduates in consultations on the formulation of complex and real problems, but also interesting for the student learning process.

4.8. ADMINISTRATION AND MANAGEMENT LEVEL

- Extension and consolidation of the PBL culture at institutional level.
- Creation/designation of a subdivision (at institutional level) responsible for pedagogical training of academic staff, including on PBL.
- Ensuring the conditions for academic staff to study the PBL method within and outside the institution (payment of courses organized by third persons/structures, providing periods for training).
- Creation of a pedagogical group for the training/improvement of academic staff in the field of interactive teaching methods, including PBL.
- Development of the technical-material base to conduct practical, laboratory and scientific research.
- Development of study infrastructure for PBL.

- Ensuring the existence in all the university subdivisions responsible for the study process of the strategic objectives on the relationship with the real sector/business environment. Assessment of the activity of those subdivisions, including in relation to these categories of objectives.
- Review of the concept/model of establishing the teachers' workload by increasing the number of hours devoted to guidance and monitoring of group work and student assessment, so that the teacher can pay sufficient attention to group work activities on tasks/projects, meetings with project teams and appropriate assessment.
- Supporting the internationalisation of study programmes: launching study programmes in international languages; supporting academic mobility of students and academic staff; attracting international students; international accreditation of study programmes.
- Elaboration and implementation of support and motivation mechanisms for the improvement and professional development of academic staff.

5. CONCLUDING REMARKS

Ensuring the sustainability of the problem-based learning in the universities of the Republic of Moldova implies a revolutionizing of the study process. It started from the fact that learning outcomes should not only provide knowledge but also develop skills and competences both professional and personal. We acknowledge that today, university study programmes still have gaps in the development of skills currently required in professional activity (interpersonal communication, professional guidance and employability and adaptation to the labour market, etc.).

Activities that should lead to the creation of skills and competences needed in the labour market (case studies, projects, internship) are not always efficiently developed or are formally carried out (e.g. students' internship).

We want, through the implementation of the PBL, to bring students closed to the real-life the real sector is facing, facilitate the mobility of students by deepening the knowledge of English language, in particular, in the specialty disciplines, but also by offering quality training, comparable to EU universities.

Obviously, all this will take time and effort from both the teachers and the university, but also the representatives of the real sector, who must be fully involved in the training activity through various activities carried out jointly. We want, in partnership with stakeholder, to propose a considerable number of themes for the project, Bachelor/Master's degree theses or joint research topics annually. We consider it necessary to develop the involvement of the real sector in such activities as student internship, student research activities, case studies, projects and other activities included in the study programme.

We believe that through the implementation of the PBL within the universities of Moldova we will be able to encourage and stimulate innovation and creativity, as well as entrepreneurial spirit.

We are aware that all these cannot be ensured immediately, namely from these considerations, the roadmaps and action plans were developed by which universities committed, step by step, in a timely manner, to achieve the intended purpose.

REFERENCES

1. The Power of Problem-Based Learning: A Practical “How to” for Teaching Undergraduate Courses in any Discipline/edited by Barbara J.Duch, Susan E. Groh and Deborah E. Allen, 2001.
2. Psychology for Psychologists: A Problem Based Approach to Undergraduate Psychology Teaching/ edited by Alexia Papageorgiou, Peter McCrorie, Stelios Georgiades and Maria Perdikogianni, 2015.
3. Problem- based Learning Online/ edited by Maggi Savin-Baden and Kay Wilkie, 2006.
4. New Approaches to Problem-Based Learning: Revitalising Your Practice in Higher Education/ edited by Terry Barrett and Sarah Moore, 2011.
5. Problem-Based Learning: Case Studies, Experience and Practice/ edited by Peter Schwartz, Stewart Mennin and Graham Webb, 2001.
6. Teaching for Quality Learning at University: What the Student Does, 4th edition/ edited by John Biggs and Catherine Tang, 2011.

Appendix 1. Report for Work Package 5: AESM

Appendix 2. Report for Work Package 5: SUARB

Appendix 3. Report for Work Package 5: SUC

Appendix 4. Report for Work Package 5: SUMPh

Appendix 5. Report for Work Package 5: SUM

Appendix 6. Report for Work Package 5: TUM