Support to strengthening the higher education system in Azerbaijan

Twinning project AZ/14/ENI/OT/01/17 (AZ/49)

Mission Report

Short-Term Mission on Activity 1.5. Provide recommendations for improvement of education standards for programmes in the priority areas (incl. legislative arrangements) with a view to describing achievements based on competences and skills, considering the AzQF

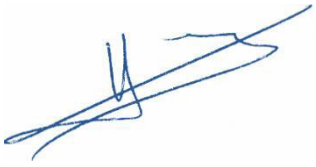
(September 10 – 21, 2018)

1. Name and Function of the Expert:

Full name of expert

Mr. Philippe Turek, France

Signature



2. Objective and Tasks of the Mission:

The mission is carried out within the framework of:

COMPONENT 1: **SELECTED NATIONAL EDUCATION STANDARDS ARE ALIGNED TO INCLUDE A COMPETENCE-BASED FOCUS**

Activity 1.5. Provide recommendations for improvement of education standards for programmes in the priority areas (incl. legislative arrangements) with a view to describing achievements based on competences and skills, considering the AzQF

Benchmarks for this activity are:

- Working sessions' training materials on the development of amendments of education standards for disciplines in particular 3 priority areas are produced;
- 12 national education standards for disciplines in three sectors.

3. Time schedule of mission:

Date and Time	Activity
Monday 10 September 2018	**09:30-12:30** **The STEs meet with the Twinning team to discuss the agenda of the mission** **13:00 – 14:00** **LUNCH** **15:00-17:00** **Meeting with the staff of the Science, Higher and Secondary Professional Education Department, MoE** **Stakeholders:** *Mr. Yashar Omarov*, RTA Counterpart, Senior Advisor at Science, Higher and Secondary Professional Education Department, MoE; *Ms. Vusala Gurbanova*, Leading Advisor at Science, Higher and Secondary Professional Education Department, MoE, CL I; *Mr. Azad Akhundov*, Senior Advisor at Science, Higher and Secondary Professional Education Department, MoE, CL II
Tuesday 11 September 2018	**10:00 – 12:30** **Meeting with members of the Working Group on Natural Sciences at the Baku State University (BSU)** **Stakeholders:** *Mr. Aydin Kazimzade*, Vice Rector for Science and Innovations, BSU; *Mr. Akif Guliyev*, Dean of Biology Faculty, BSU; *Mr. Nizamaddin Isgandarov*, Dean of Math And Mechanics Faculty, BSU; *Mr. Adil Khasayev*, Head of Career, Internship and Graduates Center, BSU; *Mr. Javanshir Kazimov*, Deputy Dean of Math and Cybernetics Faculty, BSU; *Mr. Bilal Kazimov*, Head of Department at Math and Mechanics Institute of the Academy of Sciences **13:00 – 14:00** **LUNCH** **15:00 – 16:30** **Meeting at SINAM, one of the largest IT companies in Azerbaijan** **Stakeholders:** *Mr. Abulfat Rahmanov*, Director; *Mr. Dmitry Gakh*, Project Manager; *Mr. Vusal Abbasov*, Business Development Manager; *Mr. Sergey Andrushenko*, Leading Researcher; *Mr. Hamid Abbasov*, leading programmer.
Wednesday 12 September 2018	**10:00 – 12:00** **Baku Engineering University** **Stakeholders:** *Mr. Babak Abbasov*, Head of Computer and Information Technologies Chair **13:00 – 14:00** **LUNCH**

	15:00 – 16:30 **Meeting at the Ministry of Transport, Communication and High Technologies of Azerbaijan** **Stakeholders:** *Ms. Lala Karimova*, Leading Advisor at the Department for Innovative Development of Information Society and Electronic Management; *Mr. Elvin Seyfullayev*, Senior Advisor at the Department for Management of Human Resources and Civil Service; *Mr. Vugar Guliyev*, Head of Human Resources Department, Baktelecom, state IT company under the Ministry; *Ms. Farida Fataliyeva*, Lawyer at Baktelecom; *Mr. Rashad Azizov*, Head of the Department for Innovative Development of Information Society and Electronic Management.
Thursday 13 September 2018	**10:00-13:00** **Meeting at the Azerbaijan State Oil and Industry University (ASOIU)** **Stakeholders:** *Mr. Kamil Karimov*, math teacher; *Mr. Yaqub Sardarov*, computer engineering teacher; *Mr. Tofiq Ibrahimzade*, teacher; *Mr. Vagif Karimov*, math teacher; *Mr. Rauf Mayilov*, Associate professor, teacher at Control Systems and Engineering Faculty; *Mr. Samad Yusifov*, Dean of IT Faculty; *Mr. Gasim Mammadov,* Vice Rector for Education **13:00-14:00** **LUNCH** **15:00-17:00** **Deskwork** STEs work on their mission report
Friday 14 September 2018	**10:00-11:30** **Meeting at the Azerbaijan Technical University** **Stakeholders:** **13:00 – 14:00** **LUNCH** **14:30-17:00** Meeting with the staff of the Science, Higher and Secondary Professional Education Department of MoE to report about results of the week
Monday 17 September	**10:00-12:00** The STE discusses the agenda of the mission week with the Twinning team

	13:00 – 14:00 **LUNCH** **14:30-16:00** **Meeting in AzerKosmos OJSC** **Stakeholders:** *Ms. Inara Ibrahimkhalilova*, Director of Human Resources
Tuesday 18 September	**10:00 – 12:30** **Meeting with the management of the Sumgait State University** **Stakeholders:** *Mr. Natiq Talibov,* Vice Rector for Organization of Education and Teaching Technologies *Mr. Nadir Hajibalayev,* Head of Electrotechnics and Power Engineering Chair Mr. Turgay Huseynov, Head of Electromechanics Chair *Mr. Mammadali Zarbaliyev*, Head of Physics and Solid Matters Chair *Ms. Tamella Ahmadova*, Dean of Physics and Power Engineering Faculty Mr. Fuad Mammadov, Head of General Physics Chair **13:00 – 14:00** **LUNCH** **15:00-16:30** **Meeting in Sumgait Chemical Industrial Park** **Stakeholders:** *Mr. Fuad Panahov,* Deputy Director *Mr. Elmir Mehdiyev,* Head Specialist, Unit for Relations with Investors
Wednesday 19 September	**10:00 – 12:30** **Meeting with the management of the Baku State University** **Stakeholders:** *Mr. Ismat Ahmadov,* Associate Professor, researcher at Nanotechnology Laboratory *Mr. Ahmad Abdinov,* Head of Physical Electronics Chair **13:00 – 14:00** **LUNCH** **14:15-15:45** **Meeting in the Institute of Physics** **Stakeholders:** *Mr. Nazim Mammadov,* Director Mr. Elchin Jafarov, Head of International Relations Department *Mr. Javad Abdinov,* Deputy Director on Science *Mr. Ayaz Bayramov,* Deputy Director on Innovations *Mr. Abasat Isayev,* Head of Education Department

Thursday 20 September	**10:00-12:30** **Meeting in LafargeHolcim** **Stakeholders:** *Mr. Davud Gambarzade,* Human Resources Manager *Ms. Ulduz Taghiyeva,* Human Resources Director **13:00 – 14:00** **LUNCH** **14:15 – 16:00** **Meeting at the Azerbaijan State Pedagogical University** **Stakeholders:** *Ms. Shahla Gulmammadova*, Head of Research and Development Department *Mr. Galib Sharifov*, Physics teacher *Ms. Dilbar Aliyeva*, Physics teacher *Ms. Sevinj Jalilova*, Physics Teacher *Ms. Arzu Dashdemirov*, Dean *Mr. Eldar Qojayev*, … *Ms. Nigar Abbaszade*, Vice Rector for International Relations
Friday 21 September	**10:00-11:30** **Report writing** **13:00 – 14:00** **LUNCH** **14:00-16:30** **Report writing**

4.1 Recommendations for improvement of education standards for programmes in the field of physics.

Week 1 / 10-14 sept. 2018

The expert has been working with the two other ST experts from Latvia (Asnate Kažoka, hereafter designated as AK) and France (Eliane Kotler, hereafter designated as EK). Based on his knowledge in the application of the Bologna process to physics study programmes and as operating physics teacher, he could complete the analysis of his colleagues, who were more oriented to CBA principles (AK, EK) and their application in IT study programme (AK). His input mostly relies on the importance of practical training in natural sciences, which was underlined by employers as deeply missing or not reliable in the AZ HEI teaching.

Overall, the expert contributed to the elaboration of the mission report written by AK and EK. It means that the expert fully agree with the content of this report. As will be seen below, most issues of this report have been also tackled during the second week, namely:

- Lack of up-to-date and intensive experimental training for the students and teachers
- Inadequate teaching methods by teachers
- Lack of some generic competences for students, e.g. foreign language (English for natural sciences), use of basic software suite to present and disseminate their work.

Week 2 / 17-21 sept.2018

As a ST expert, I was alone during this week. I have much benefited from the contributions of the resident delegate of the twinning project, Lisa Bydanova, and from the assistance of the local team, Tarlan Arzumanov and Aytaj Atakishiyeva.

Act. 1.5 was the main topic. It has been dedicated to the assessment of the State Standards of Higher Education for a Bachelor study programme in Physics with respect to a competence based approach (CBA), and its discussion with different stakeholders, namely employers and university representatives. I will give a general overlook of this week devoted to meeting with:

i) representatives of the labour market, whether private or governmental (Azerkosmos, Sumqayit Techno Park, Academy of Sciences/Institute of Physics, Lafarge Holcim),

ii) representatives of the two universities offering physics degree, namely Sumqayit State University (SSU) and Baku State University (BSU, and of the State University for Pedagogy

Prior to the field study, I worked on the State Standards of Higher Education for a Bachelor study programme in Physics. This has been designed by the working group acting for the Ministry of Education (MoE) that we met the previous week. Regarding its presentation, it appears that there is the need to add a summary to this extensive list of competences. As a matter of fact this document is too long to be attractive for an external reader. It is suggested to add a “Tuning-like” fiche to be disseminated by all means (trial example given as Annex 1), and probably to appear on the Web site of Faculties.

The list of competences is fully matching most of the generally admitted generic and specific competences (European Physical Society, 2009, and TUNING project, 2010), as recalled in the presentation given in Annex 2. Moreover, the syllabus is consistent with what could be expected as specialized learning outcomes for such a general bachelor degree in physics. This is also true for the State Standards of Higher Education for a Bachelor study programme designed for teachers in physics

It appears that the CBA is welcome by employers as well as by university representatives. It has been admitted by our interlocutors that describing physics study programmes by competences rather than giving only a technical syllabus better meets the requirement of understanding by a larger audience, i.e.

students and their relatives, employers, teachers. As a test, this has been (partially, due to time) trained with our hosts. The result is given in Annex 3. I have also introduced the concept of Professional Bachelor, as currently trained in France. This has been presented as a possible issue for a better adjustment to the labour market, in order to meet the needs for middle management positions.

We could not perform a comprehensive SWOT analysis with our correspondents, but we emphasize hereafter the main issues raised by them during the discussions.

Employers:

- are satisfied by the basic knowledge of the graduates[1]
- spend too much time to train graduates once hired, given their poor knowledge of nowadays instrumentation and relevant software (lack of practical training with up-to-date equipment)
- think that the teaching staff is not well trained as well
- agree to discuss with the teaching staff and to help improve the study programmes
- are interested in the track of professional bachelor

University staff:

- is strongly motivated to do the best for their students,
- but is not able to do better, due to the lack of up-to-date equipment in the teaching labs, and the lack of training on these for themselves
- agrees to discuss with the employers in order to increase the rate of employment of the graduates
- are interested in the track of professional bachelor

Recommendations.

- Avoid learning by heart for students, which is currently taught at the primary and secondary school, and even at the university. This is a major obstacle for learning to learn, which develops creativity and fosters innovation. [Note that the representatives of the Baku University for Pedagogy say they cannot implement this rapidly due to the former generation of teachers presently teaching.]
- Assess the implementation of the study programmes within the universities. There may be a gap between writing/speaking and operation.
- Upgrade the equipment for practical training labs
- Bring down the average age of the teachers
- Train teachers to the use of up-to-date equipment and teaching methods
- Improve the knowledge of teachers at primary and secondary school and within HEIs
- Establish a set of rules, which makes it mandatory to connect labour market and HEIs representatives while defining the study programmes
- Makes it mandatory to collect data on the students employment for each programme
- Assess the efficiency of the career office within HEIs
- Makes it mandatory to check the quality and effectiveness of the internship
- Bring labour market closer to HEIs

[1] The Institute of Physics of ANAS is quite apart in this study. It is actually a centre of excellence, regarding the high level of equipment and the quality of the research performed there. The demand is for a better understanding of what is considered by them as poorly taught and/or understood at the university.

To do so may take time and it is costly. A strategy may be one of germination and growth by selecting some pilot universities. The implementation of the suggested evolutions and its assessment will contribute to the training of new teachers, engineers, researchers. These seeds could then spread over the whole educational and industrial network throughout the country.

Annex 1. TUNING fiche as an example of short description of a CBA study programme

Annex 2. Presentation made to University staffs

Annex 3. Priority-ranking of competences as suggested by Sumqayit University and Baku State University

Annex 4. Examples of curricula of the University of Strasbourg (some in English, some in French) which are available from Lisa Bydanova

Annex 1. TUNING fiche for the short presentation of a study programme for a Bachelor of Physics

This fiche is an example described in the TUNING project[2]. Most items are directly taken from this example, and adapted in some places to the programme offered by the Faculty of physics and engineering of the University of Strasbourg.

BACHELOR OF PHYSICS GENERAL STUDIES		
Type of degree & length		*Single degree / 180 ECTS (= 6 semesters)*
Institution		*Title of HEI: to be completed*
Accreditation. Organisations(s)		*Ministry of Education, HCERES (High council for the assessment of research and higher education)*
Period of Reference		*The study program is validated for 5 years starting from 2018*
		QF for EHEA: 1st cycle; EQF level 6
A	**Purpose**	
	This bachelor programme is intended to give students a strong background in physical sciences. This is necessary either to integrate one of the masters of the Faculty of physics and engineering (teaching, research, industry) or a master degree from another University. Another way is offered to specialize, after the second year (L2), in order to obtain a vocational bachelor degree to enter directly the professional life. The faculty offers several professional bachelors with some possibilities to prepare them as work-study programmes through partnership with companies.	
B	**Characteristics**	
1	Discipline(s)/ Subject areas	The main discipline is general physics. The partition is: physics, mathematics, computer science, chemistry, other (50: 18: 8: 7: 17)
2	General/ Specialist Focus	General education in experimental and theoretical physics.
3	Orientation	Research-based curriculum with specializations considering opportunities specific to job / career: (subjects of theoretical physics and applied physics) physics, biophysics, computer science, material science.
4	Distinctive Features	
C	**Employability and further Education**	
	Employability	Positions in companies / businesses and institutions (research / quality assurance, trade) in the areas of technology and Informatics, biomedical and pharmaceutical, the sector of the environment. Positions in financial institutions. Positions in education.
	Further Education	Master's programmes in Physics (theoretical physics, applied physics), interdisciplinary programs related to Physics (Biophysics, medical physics, geophysics), master's programmes in engineering / physics technology or computer science.
D	**Educational style**	
	Learning/	Lectures, classes of lab, tutorials, individual study based on text books and reading

[2] From Tuning, *A guide to formulating degree programme profiles*, Bilbao, Groningen and the Hague, 2010, p. 80-82.

	teaching approaches	notes, individual consultations with teachers, internship in a research lab on a given topic. 27% of the overall teaching in physics is dedicated to experimental practice.
	Assessment method	Written tests, oral tests, lab reports, oral presentations, ongoing evaluation, public presentation and defence of the internship project
E	**Programme competences**	
1	GENERIC The programme includes the generic competences (or key skills) expected of first cycle graduates. The students should be able to: • Establish their role and mission within an organization to adapt and take initiatives. • Identify the process of production, dissemination and enhancement of knowledge. • Respect the principles of ethics, ethical and environmental responsibility. • Working as part of a team while being independent and responsible with respect to a project. • Identify the professional fields potentially in relation to the achievements of the bachelor curriculum. • Characterize and enhance their identity, their skills and their professional project according to a context. • Able to step back from a situation, self-evaluate and questioning himself in order to improve knowledge Transverse and language competences • Use digital tools of reference and the rules of computer security to acquire, process, produce and disseminate information as well as to collaborate internally and externally. • Identify and select various specialized resources to document a subject. • Analyse and summarize data for their treatment. • Develop an argument with critical mind. • Use easily the different registers of written and oral Azeri expression. • Understand, speak and write currently in at least one foreign language.	
2	SUBJECT SPECIFIC Within the context of the student's field of professional practice, the graduate is able to demonstrate capability in: • Mobilize the basic concepts in order to: simulate, analyse and solve simple problems • Address a complex problem and solve it step by step • Identify the different steps of an experimental approach and perform it. • Use the measurement devices and measurement techniques commonly used in the lab and in different areas of physics. • Interpret the experimental data in order to be able to simulate them. • Probe a model upon comparing its predictions to experimental results and assess its validity range. • Identify the sources of errors for an experimental result in order to assess its uncertainty range. • Suggest analogies, estimate orders of magnitude, and be able to understand their meaning. • Use the main mathematical tools relevant for physics. • Handle the basic mechanisms at the microscopic scale, simulate the macroscopic phenomena, and make the bridge between macro and micro. • Make a sound use of some data acquisition and analysis software • Use an up-to-date programming language • Identify the currently used techniques in the areas of: fluid mechanics and solid state mechanics, materials science, chemistry, geosciences, thermodynamics and thermal engineering, computer sciences, astronomy / Note: this should be related to each HEIs specific fields, e.g. excellence fields • Identify the peculiar regulations and implement the main preventive measures regarding health	

	and safety system.
F	**Programme learning outcomes**
	Within the context of the student's field of professional practice, the graduate is able to demonstrate capability in: • Knowledge of basic mathematics and related subjects (including mathematical methods for physics; computing; numerical analysis) • Knowledge of basic physics (introduction to physics; mechanics, vibrations and waves, acoustics, optics, thermodynamics, electromagnetism; quantum physics, statistical physics) • Knowledge of experimental methods (asking the right questions, measurement theory and treatment of experimental errors, instrumentation) and awareness about professional integrity and how to avoid plagiarism • Knowledge of basic elements in theoretical physics (analytical mechanics; classical electromagnetism, relativity, etc.; quantum mechanics / theory; statistical physics) • Knowledge of elements of applied physics and related subjects (chemistry; electronics & related; etc.) • Knowledge of basic elements in modern physics (atomic, nuclear and sub-nuclear, solid state, astrophysics) • Small intermediate or final physics project(s) • Other essential elements, in varying amount depending on the institution (e.g. Knowledge of topics «chosen from list(s); presenting a lab report, taking active part in a seminar) • Some knowledge/abilities in non-standard subjects, in varying amount depending on the institution (e.g. vocational training, skills development, placement, etc.)

Annex 3. Priority-ranking of competences

B. Sc. Physics – Pre-professional competences	Classified by priority level (1→n)
Establish his role and mission within an organization to adapt and take initiatives.	1
Identify the process of production, dissemination and enhancement of knowledge.	
Respect the principles of ethics, ethical and environmental responsibility.	2
Working as part of a team while being independent and responsible with respect to a project.	1
Identify the professional fields potentially in relation to the achievements of the bachelor curriculum.	3
Characterize and enhance his identity, his skills and his professional project according to a context.	
Able to step back from a situation, self-evaluate and questioning himself in order to improve knowledge	3/2

Sumqayit University / Baku State University

B. Sc. Physics – Transverse and language competences	Classified by priority level (1→n)
Use digital tools of reference and the rules of computer security to acquire, process, produce and disseminate information as well as to collaborate internally and externally.	
Identify and select various specialized resources to document a subject.	
Analyse and summarize data for their treatment.	3
Develop an argument with critical mind.	1
Use easily the different registers of written and oral Azeri expression.	2 / 1
Understand, speak and write currently in at least one foreign language.	3 / 2

B. Sc. Physics – Specialized competences	Classified by priority level (1→n)
Mobilize the basic concepts in order to: simulate, analyse and solve simple problems	
Address a complex problem and solve it step by step	2
Identify the different steps of an experimental approach and perform it.	
Use the measurement devices and measurement techniques commonly used in the lab and in different areas of physics.	3 / 3
Interpret the experimental data in order to be able to simulate them.	4
Probe a model upon comparing its predictions to experimental results and assess its validity range.	
Identify the sources of errors for an experimental result in order to assess its uncertainty range.	5 / 5
Suggest analogies, estimate orders of magnitude, and be able to understand their meaning.	
Use the main mathematical tools relevant for physics.	2 / 1
Handle the basic mechanisms at the microscopic scale, simulate the macroscopic phenomena, and make the bridge between macro and micro.	4
Make a sound use of some data acquisition and analysis software	
Use an up-to-date programming language	
Identify the currently used techniques in the areas of: fluid mechanics and solid state mechanics, materials science, chemistry, geosciences, thermodynamics and thermal engineering, computer sciences, astronomy	1
Identify the peculiar regulations and implement the main preventive measures regarding health and safety system.	

Annex 4. Examples of curricula of the University of Strasbourg (some in English, some in French) which are available from Lisa Bydanova

- Bachelors for Physics including professional bachelors (pedagogical book of the faculty of physics and engineering) / in French
- French-German Master in polymer sciences