



Strengthening Teaching Competences
in Higher Education
in Natural and Mathematical Sciences

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Report on the practice in teaching and learning at the EU HEIs

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Authors of the Report

Romeo Mano	University of Gjirokaster
Luiz Seity	University of Gjirokaster
Irma Gjolleshi	University of Gjirokaster
Jelena Ignjatović	University of Niš
Luis J Rodriguez-Muniz	University of Oviedo
Janis Vladimir	University of Banska Bystrica
Martin Valcke	University of Ghent
Maria C. Canadas	University of Granada
Irina Perfilieva	University of Ostrava
Petra Murinova	University of Ostrava

Introduction

The TeComp project has set a clear goal to enhance the quality of teaching and learning at university level, in partner countries (PC), Serbia and Albania especially in the field of natural and mathematical sciences by transferring the experience of European HEI-s.

For this purpose, a survey was carried out by means of questionnaires filled out by teaching staff and students, to identify the current situation in the university frameworks in Serbia and Albania. It was found that their performance and quality require improvement.

On the other hand, forms and models of teaching and learning at the EU HEIs are collected through reports of each respective partner institution. The findings will allow the consortium to carry out a comparative analysis between the performance of EU HEI-s on one hand and Serbian and Albanian ones on the other hand, which will be a good starting point for the implementation of the planned activities in the framework of the project and the accomplishment of its objectives.

1 Rational behind the study

During the preparation of the project application, it was evident that significant variations in current state of art in higher education exist between EU and PC higher education institutions (HEIs). The aim of this survey was to evaluate differences and find examples of good practice across EU/PC so that appropriate standards, tools and mechanisms can be developed and implemented to enhance the quality of teaching and learning by usage of modern pedagogy, methodology of teaching and contemporary technologies in the field of natural and mathematical sciences at the PC institutions. EU partners, University of Oviedo (UNIOVI), “Matej Bel” University of Banska Bystrica (UMB) and the University of Ostrava (UO) started distributing questionnaires during the May 2019 and collected responses by the end of June. The number of questions was fewer then in the surveys provided at the universities in Serbia and Albania, but with the same goals to make direct comparison of EU and PC outcomes possible. From the project management there was a significant desire, even though starting activities began late, to conduct the assessment/survey and try to catch up with the original project schedule in the first six months of the project.

Table 1.1.: Distribution of obtained responses per institution and target group

	UNIOVI	UMB	UO
TEACHERS	18	13	8
STUDENTS	19	22	14

From Table 1.1 it is clear that only a limited number of responses was received from particular target groups hence evaluation of the data may not be a true state of EU. Having said that an effort was put in to draw significant conclusions that will be used to shape the future of the project and have an information-based decision-making process. Because of that, additional reports, based on experiences

collected by representatives of the PC HEIs during their visit to UNIOVI, UBB and UO were created. Some differences in practices between EU partners are noticed, so the other EU partners, University of Ghent and University of Granada made additional reports which were of great help.

Once individual analyses were performed by the project coordinator UNI, and information was sent to the University of Gjirokaster. The individual reports were sent to the WP leader, as well, where the information was carried out and a unified report created. Just as many conclusions those obtained here in should be considered with a caution.

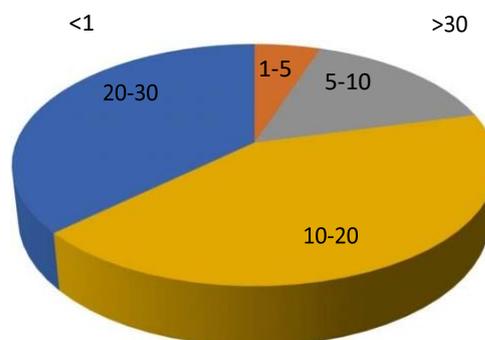
Therefore, it would be wrong to conclude that what is presented herein is representative of the HEI practices across Europe. Having said that, the obtained information is significant and has some significant correlations between different institutions.

EU HEIs are definitely recognised by great effort and success in using new pedagogical and methodological methods and the high level of integration modern technologies in teaching and learning process.

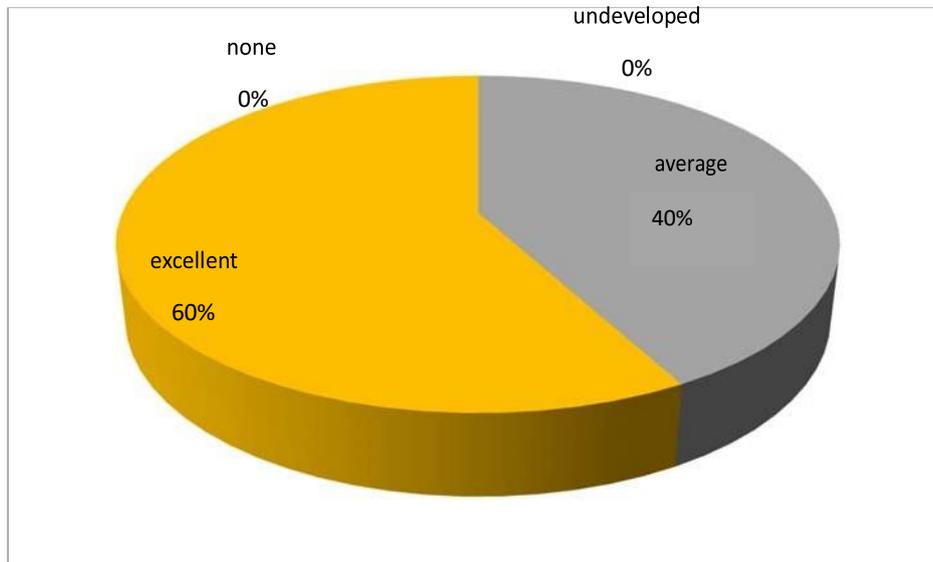
2 Teachers

A total of 39 responses were received and analysed of which 21 were female, 15 male and 3 did not confirm their gender.

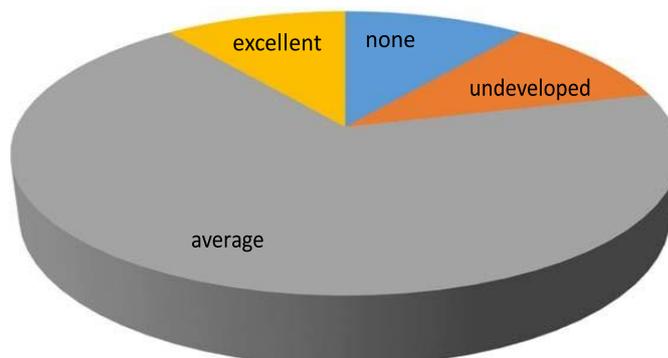
Graph 2.1. points out the level of experience of teachers participating in this survey with the majority of them having more than 10 years of experience. Interestingly, there were no teachers with less than a year or more than 30 years of experience.



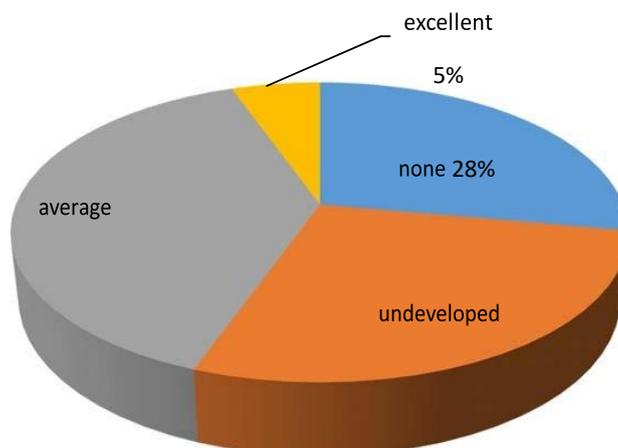
As the assessment of knowledge and skills in using particular software is concerned Graphs 2.2. - 2.5. demonstrate different levels of skills among EU educators.



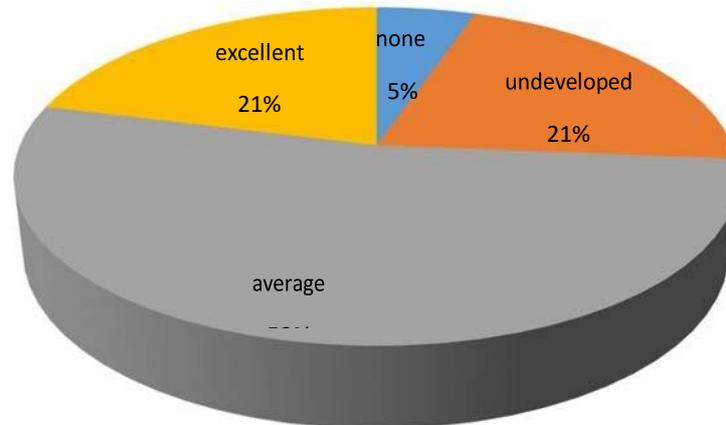
Graph 2.2. Knowledge and skills in using Office package Software



Graph 2. 3: Knowledge and skills in using LMS Software



Graph 2.4: Knowledge and skills in using Web Conferencing Software



Graph 2.5. Knowledge and skills in using Statistical Data Analysis Software

When analysing the data it was interesting to see that for the Office package (Graph 2.2) the majority of teachers consider themselves to have an excellent knowledge of this software (58%). Those who decided to opt for an average knowledge (42%), all come from the same institution. This may suggest that they either do not use Office software to its full potential or there is insufficient training available for them to develop these skills fully.

Use of Learning Management System (LMS) software (Graph 2.1.3) presented a clear indication that this package is not part of common teaching culture. Average knowledge dominates the survey (68%) and the rest of the responders equally stated (11%) to have excellent, undeveloped or no knowledge of LMS. Proportionally, the poorest knowledge (undeveloped and none 56%) is associated with teachers use of Web Conferencing Software as presented in Graph 2.4. When deeper discussion and analyses of the results was performed, the following reasons for such a poor outcome were obtained. There are a number of Web Conferencing Software packages available; some require technical knowledge (obtaining and inputting IP address) and different institutions may use different software. In addition, rare requirements for the use of Web Conferencing Software led to lower interest towards development of necessary skills.

Finally, knowledge and use of Statistical Data Analysis software is diverse (Graph 2.5) and depends on the research requirements of a particular academic. The numerous of teachers stated that they have average (53%) skills of using Statistical Data Analysis Software and the rest of the responders suggested, equally, having excellent (21%) and undeveloped (21%) knowledge in using these packages.

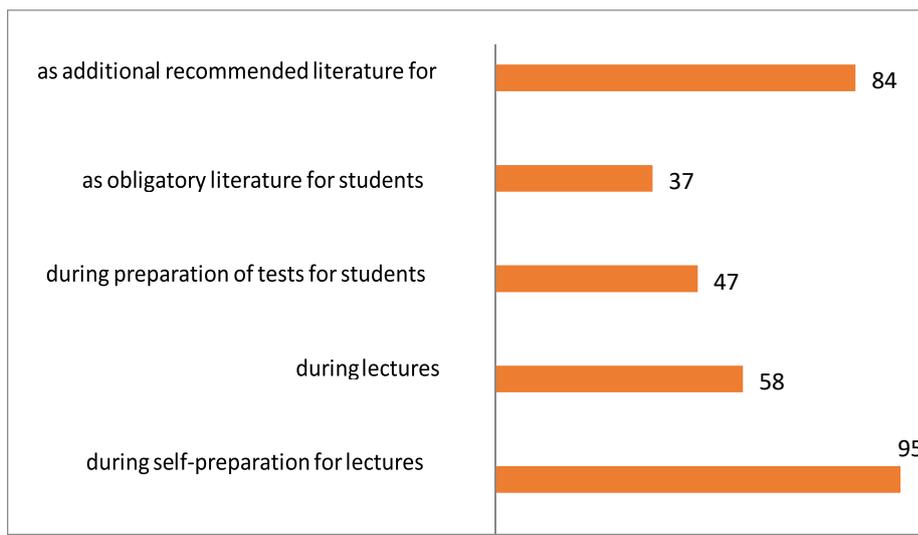
Open educational software considered to be of great use in teaching and learning includes forums, webinars, tests, papers, publications, e-book, electronic materials and pictures etc.

Table 2.1. Use of different OESs in education (%)

Open educational software	never	occasionally	often
scientific papers (open access)	5	26	68
printed publications (books, journals) (open access)	0	42	58
e-books/e-textbooks	0	63	37
other electronic textual material (brochures, presentations, promotional materials)	0	63	37
pictures/animations	0	42	58
videos	16	79	5
forums and other forms of online communications	47	47	5
webinars	53	37	11
online courses at internet	32	63	5
web-conferences	63	37	0

When asked how OESs are used responses pointed out that they are used predominantly during the preparation of lectures (95%) and as additional recommended literature (84%) as shown in Graph 2.6.

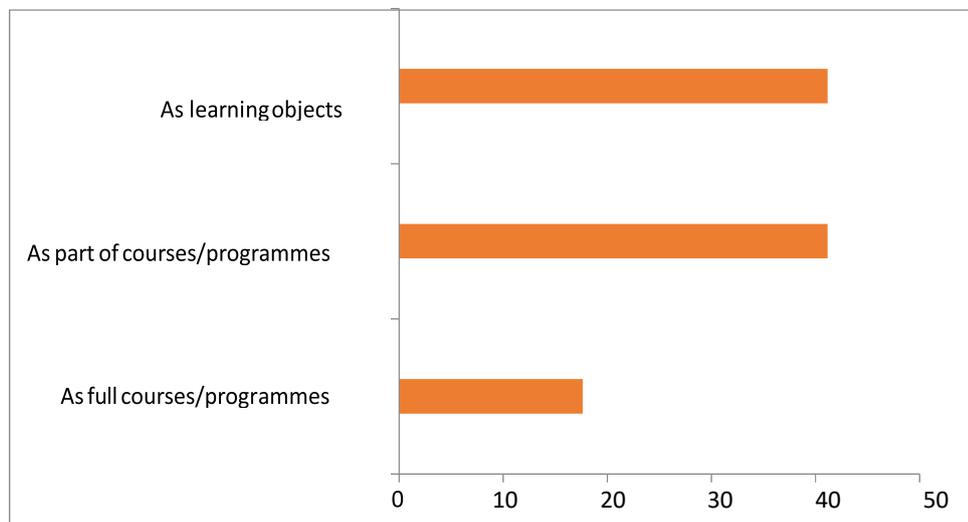
Graph 2.6. How and when OESs are used as educational material



Assessment of the impact of the use of OESs on the quality of lectures has indicated that (76%) teachers responded positively, and (24%) stated that OESs didn't increase the quality of lectures. This points out that a significant number of educators value OESs and the teaching benefits they bring.

Almost all (90%) of the responders stated that they have never been involved in joint production of OESs with educators from HEIs and similarly (79%) in exchange of OESs with colleagues from other educational institutions. Others who responded positively stated that they interacted with colleagues from the same institution/state. This should be looked at in conjunction with other responses to ascertain why there is limited collaboration in production and distribution of such important educational resources.

OES content of produced documents is mainly used as learning objects (41%) or part of a course (41%). A minority of responders stated that they are producing OESs as a full course.



Graph 2.7. OES content of produced courses

Table 2.3: The most significant barriers for engagement of other colleagues in the production of OESs content in percentages.

	Very important				Not important
Lack of skills	11	33	39	6	11
Lack of time	74	16	11	0	0
Lack of hardware	0	0	18	59	24
Lack of software	6	11	56	11	17
Lack of computer access	0	0	11	39	50

Table 2.3 points out that the most significant barrier for engagement of other colleagues in the production of OER content is the lack of time, followed by lack of skills and lack of software. On the other hand both the lack of hardware and lack of computer access is not considered as threats for the engagement in colleague's production of OERs.

Table 2.4: The use of the e-learning tools among teachers (%).

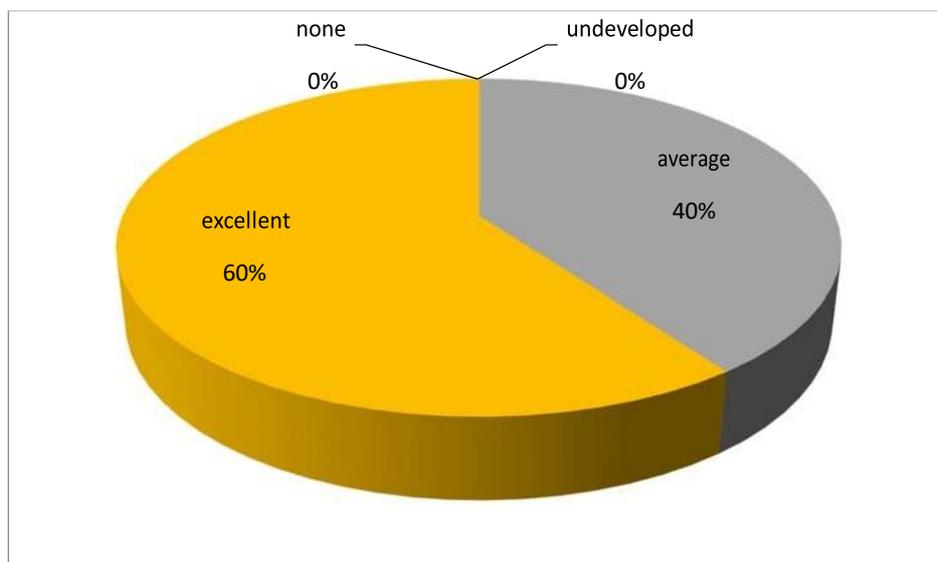
	YES	NO
Moodle platform (or equivalent)	91	9
interactive online or offline theoretical classes	31	69
online or offline resources for learning about the functioning and operation of instruments	65	35
software for simulation/conducting practical work	38	62
web-conferences	17	83

The survey revealed, that the majority of teachers have used Moodle or an equivalent Virtual Learning Environment (VLE) (91%). To a lesser extent (65%) they have used online or offline resources for learning, but significantly fewer respondents have used software for simulation (38%) and interactive online or offline theoretical classes (31%). Only (17%) of the teachers surveyed used web conferencing as e-learning tools. This follows a good trend seen previously when the same interviewees stated that they do not often use simulation software.

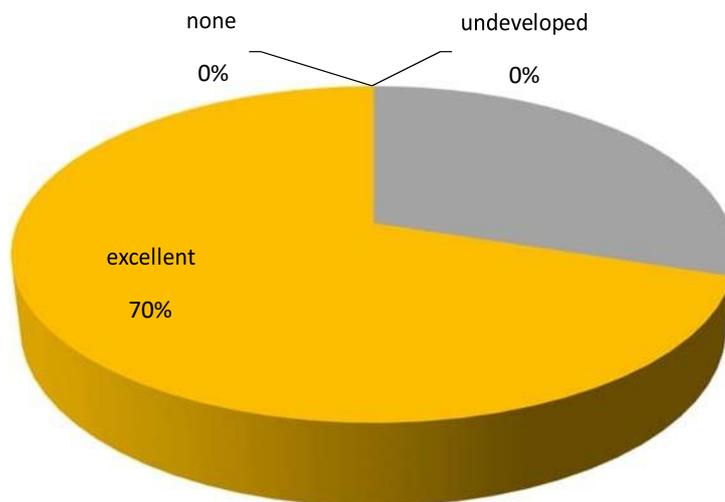
3 Students

Of the total number of 55 students who participated in this questionnaire, 15 were PhD students, 19 MSc and 21 BSc. 33 students were male, 21 female and one didn't state his gender. Data analysis will be presented together unless there is significant difference in responses between MSc and PhD students in which case differences will be evaluated and presented.

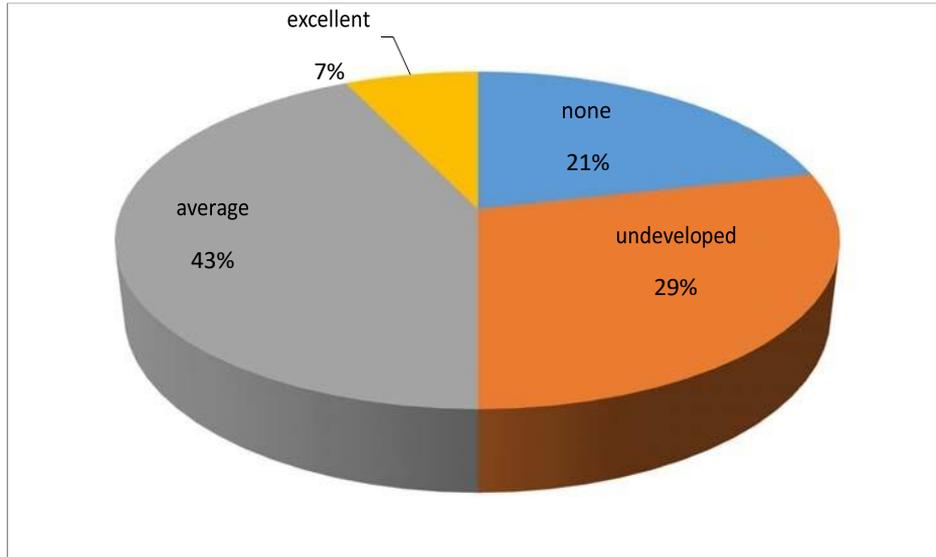
Graphs 3.1- 3.5 demonstrate different levels of skills in using software among EU students.



Graph 3.1a: Knowledge and skills in using Office package Software for PhD students

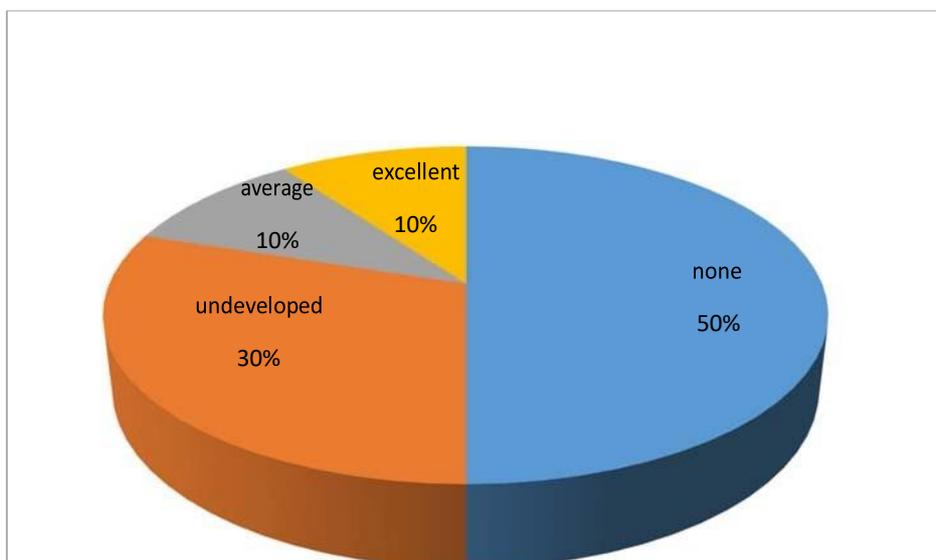


The majority of students have excellent Office Software skills, although MSc students think that they are more confident with their level of knowledge.



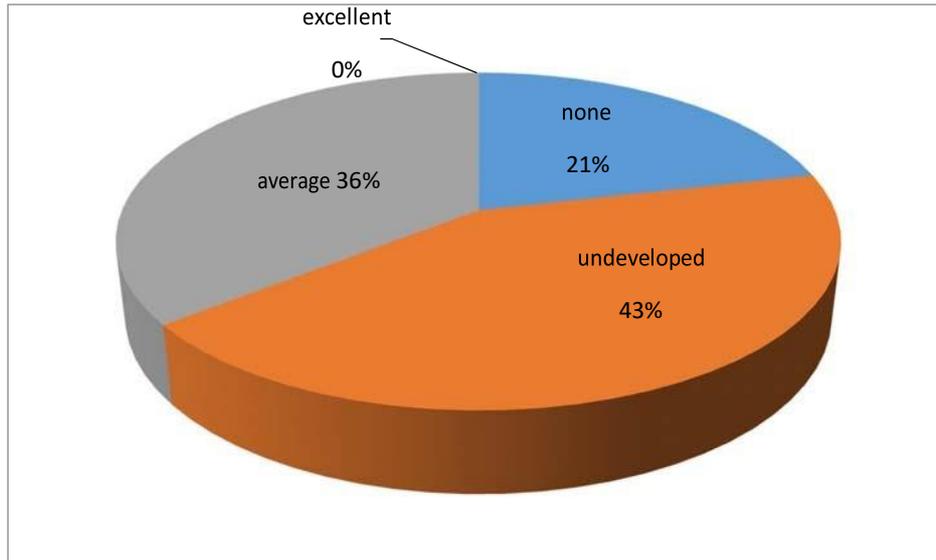
Graph 3.1b: Knowledge and skills in using Office package Software for MSc students

Graph 3.2a: Knowledge and skills in using LMS Software for PhD students

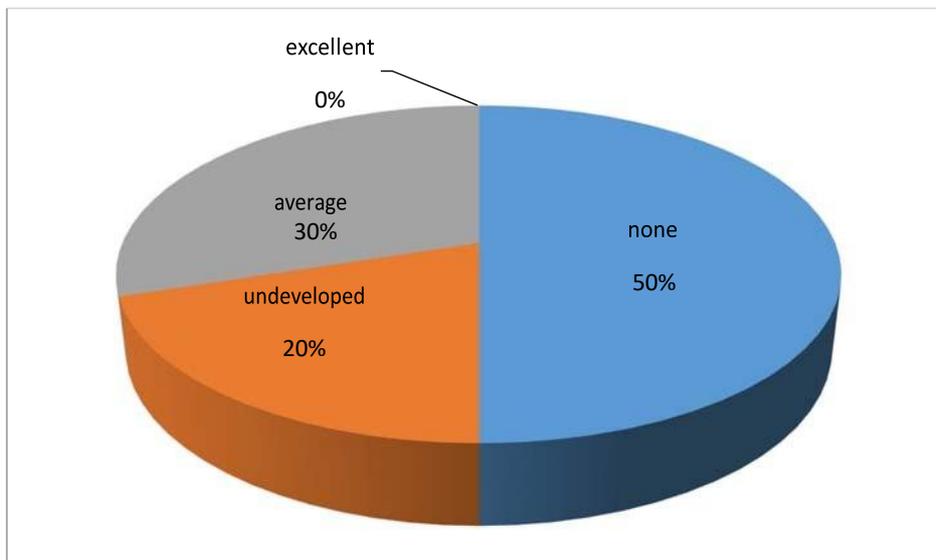


Graph 3.2b: Knowledge and skills in using LMS Software for MSc students

Learning Management System software divides clearly into two groups where PhD students have greater overall knowledge, although more MSc students have stated that they believe they have excellent knowledge in this area.

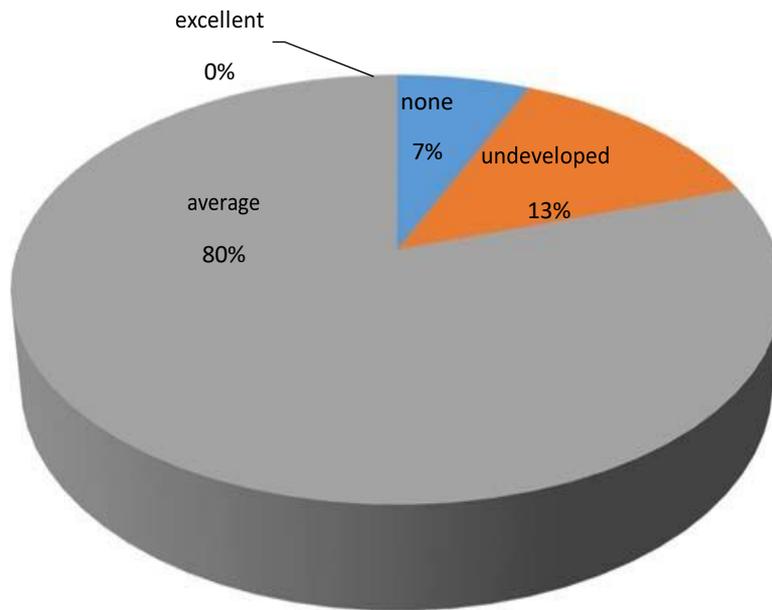


Graph 3.3a: Knowledge and skills in using Web Conferencing Software for PhD student

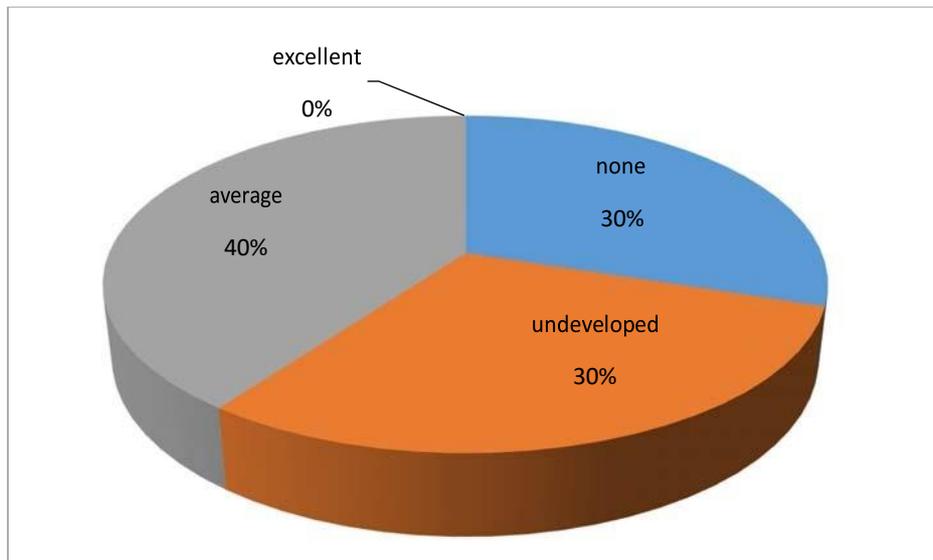


Graph 3.3b: Knowledge and skills in using Web Conferencing Software for MSc students

Web conferencing software has a similar trend (PhD students greater level of knowledge), but an important point to notice is that none of the students stated that they have excellent knowledge in this area.



Graph 3.4a: Knowledge and skills in using Statistical Data Analysis Software for PhD students



Graph 3.4b: Knowledge and skills in using Statistical Data Analysis Software for MSc students

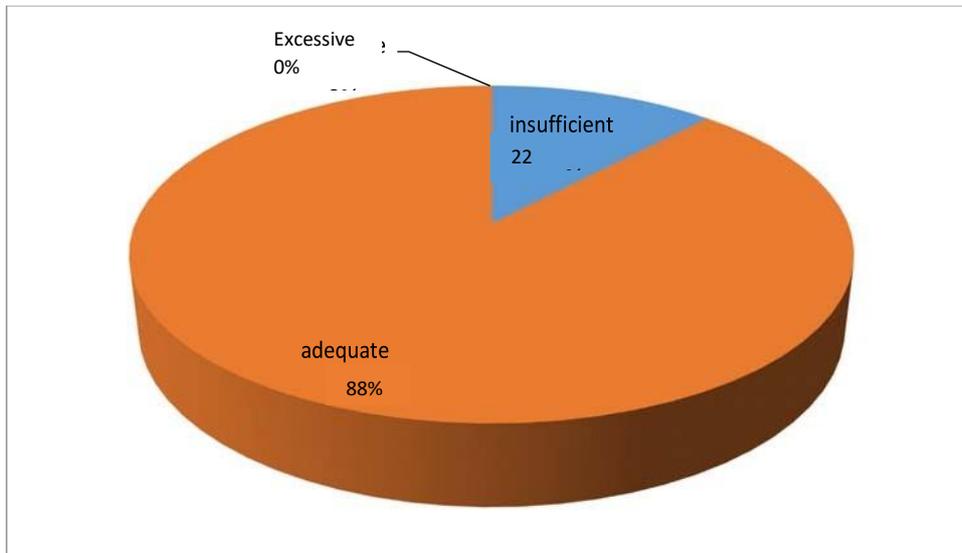
The trend between MSc/PhD students' knowledge is continued with respect to Statistical Data Analysis software where the majority (80%) of PhD students have average skills in the use of it, whilst only 40% of MSc students have average skills, 30% of them undeveloped and 30% do not have any skills in using Statistical Data Analysis Software. This is linked nicely to the nature of their study as PhD students are involved in cutting edge research where Statistical Data analysis is one of the major tools. In contrast MSc students often conduct smaller research tasks on known samples, hence Statistical Data Analysis is performed to a lesser extent.

When students were asked about the use of IT classrooms both PhD and MSc groups responded that only 24% of them are using these facilities. This is normal as the majority of students have individual laptops that they can use so that there is no need to get into IT dedicated classrooms. Also 92% of students confirm that they can use computers in the library.

Open educational softwares (OESs) are used to a different extent amongst students. This is indicated by the different types of educational engagement as presented in Table 3.1. Interestingly, OERs which are traditionally considered to take up more time, such as movies, webinars and web-conferences are used only occasionally or never at all. In addition, items such as pictures, simulations, forums and online courses are more favoured for occasional use rather than never at all, as seen in previous case. In contrast, papers, publications, e-books and electronic materials are used often or occasionally but are rarely never used.

Table 3.1: Students' use of different OERs in education (%).

OES	never	occasionally	often
scientific papers (open access)	0	32	68
printed publications (books, journals) (open access)	0	28	72
e-books/e-textbooks	12	28	60
other electronic textual material (brochures, presentations, promotional materials)	8	60	36
pictures/animations	16	68	16
videos	52	36	12
forums and other forms of online communications	24	56	20
webinars	44	44	12
online courses at internet	28	56	16
web-conferences	44	52	4
databases	12	40	48



Graph 3.5: Use of OER in lectures by lecturers

It is worth noting that 88% of the interviewees stated that learning is better and of a higher quality when lecturers use OER during classes or practical laboratory work. Furthermore, 92% stated that learning is better and of a higher quality when they use OESs recommended by teachers or those they found during their study. These results show the importance of the use of OERs, but also puts a significant emphasize on the development of OESs that are of a high quality, peer reviewed and have a great educational value. This is definitely true when you link previous questions to the one about the credibility of OESs used. Both groups stated that they do not use resources recommended by their teachers which in this case means that it is most likely not only associated with this cohort of students, but also other students outside of this study. From other sources there is a clear difference between MSc and PhD students in the way they approach selection and use of the OESs. PhD students are more careful about the source of information that they use. 75% will only use OESs from reliable sources versus only 30% of MSc students. A significant proportion (70%) of MSc students never think about how reliable the information is that is presented in OESs. As stated above we need to look more carefully into this matter and either train students to recognise reliable sources or start producing reliable OESs for students' use.

Evaluation of the use of e-learning tools among MSc and PhD students pointed out to a great use of Moodle and online/offline resources as presented in the following table 3.2. However only 50% of them use interactive online or offline theoretical classes. A significant difference between MSc and PhD students was noticed when looking at a more technology driven e-learning approach whereby only 10% of MSc students used software for simulation vs. 71% of PhD students. In addition, none of the MSc students used web conference facilities whereas 36% of PhD had experience of using web conferences.

Table 2.2.2: The use of the e-learning tools among students (%)

	YES	NO
Moodle platform (or equivalent)	87.5	12.5
interactive online or offline theoretical classes	50	50



online or offline resources for learning about the functioning and operation of instruments	71	29
software for simulation/conducting practical work MSc/PhD	10 71	90 29
web-conferences MSc/PhD	0 36	100 64

Reports of EU partners

REPORT ON THE SITUATION OF HIGHER EDUCATION, THE APPLICATION OF PEDAGOGICAL METHODS AND ITS TECHNOLOGIES AT THE UNIVERSITY OF GRANADA

General framework

University of Granada was founded in 1526 by Charles V and got the Papal Bull in 1531. It is one of the older ones in the country. It is an intercontinental university with seven campuses in three different cities: Granada (Europe), and Ceuta and Melilla (Africa). Also, it has what is considered a “virtual campus”. The location of the campuses made the university the perfect bridge between Europe and Latin America because of the language and the cultural connection, and the Mediterranean countries, and with Africa due to the campuses in the North of Africa (Ceuta and Melilla). University of Granada is open to the world. One indicator is that it has students from 114 countries, and 800 bilateral and multilateral mobility agreements with institutions around the world. This makes this university to be the leader of European Universities in incoming and outgoing student mobility. It has a wide selection of cutting-edge quality programs with a clear international vocation for more than 60,000 undergraduates. In total, considering also the postgraduates, there are 80.000 students. 9% are international students at undergraduate level, and 21% of international students at postgraduate level. Nowadays, University of Granada welcomes more students from international mobility programs than any other Spanish university. The city is the University and the University is the city: one in four inhabitants belong to the UGR. Leading University in Spain in socioeconomic impact on surrounding province and region. University of Granada is a public and comprehensive university focused on teaching, research and outreach.

The Bologna Process

The Bologna Process, launched with the Bologna Declaration, of 1999, is one of the main voluntary processes at European level, as it is nowadays implemented in 48 states, which define the European Higher Education Area (EHEA). Spain is one of the countries involved in this process.

The university degrees in Spain, adapted to the European Higher Education Area (EHEA) entails three formative levels: grade, master and PhD. These degrees have validity in the 49 countries that are part of the EHEA. The main objective of the EHEA is to facilitate the mobility of students, university teachers and graduates among these countries.

European credit transfer and accumulation system (ECTS) is a credit system designed to make it easier for students to move between different countries. Since they are based on the learning achievements and workload of a course, a student can transfer their ECTS credits from one university to another so they are added up to contribute to an individual’s degree programme or training.

Most of the degrees in Spanish universities consist on 240 ECTS distributed in 4 years.

At the University of Granada, the Vice Rector for Teaching is responsible for all aspects related to the different undergraduate and postgraduate studies at the University of Granada and aims to ensure the correct development of official university teaching (undergraduate, master's and doctoral degrees) as well as non-official university teaching (own degrees).

The teaching methods and the organization of the teaching are coordinated by the teaching departments (which provide the teachers, and are organized by knowledge fields) and the faculties (which have the competencies in the quality control of the teaching practices). Teachers are also supported by the Centro de Producción de Recursos para la Universidad Digital (CEPRUD, its acronym in Spanish).

The Quality, Teaching Innovation and Foresight Unit of the University of Granada has a Training and Teaching Innovation Plan, with the aim of guaranteeing quality teaching and facilitating the professional development of its teaching staff.

Teaching methodology

In every study program (bachelor's and master's degrees) there exist a memorandum, approved by the National Agency for Quality in Higher Education (ANECA), establishing a framework for the type of methodologies which will be used in every subject and the distribution of these types. Every year, the teachers who are assigned a course must present a teaching guide specifying those methods for the following academic year: what type of teaching methodology, what type of assessment, the weight of every assessment instrument, etc. This teaching guide must fit within the framework established in the memorandum. This is controlled by a Quality Commission in every faculty, and also the departments must approve the teaching guides. Therefore, teachers have a certain margin of freedom to decide, but they cannot change the methodology as it was established in the memorandum.

Types of teaching sessions

One of the challenges of the Spanish universities was to organize the teaching with bigger groups than those hypothetical groups in the EHEA. In some Spanish degrees as for example Primary teachers degree we have more than 80 students. For these cases we have to adopt some methodological decisions because it was impossible to count with groups of 25-30 students always: the whole groups attend to theoretical sessions and we divide the whole groups into two or three subgroups of 25 students each for practical sessions, seminars and other kinds of sessions that required more interaction and the use of manipulative, virtual and digital media.

The University of Granada acknowledges 4 type of teaching sessions:

- **Expositive lectures:** it is conceived for greater groups of students, having a less active role. The teacher assumes the leading role, conducting the lesson by expositions, presentations or explanations (written or oral, generally supported by technologies). Of course, students can also participate. The number of students can vary depending on different variables such as the degree, the kind of contents, or the faculty for example.
- **Practice lectures:** this type is for medium-size groups, generally for each expositive lesson group there are two practice lectures groups (average size is between 20 and 40 students per group).

As its name says, practice lectures are conceived with a basically practical orientation, thus, contrary to expository lessons, here the students' role becomes much more active.

- **Lab lectures:** the size of these groups is limited by the physical restrictions on the laboratory which is used (number of seats, number of computers, etc.) and there will be always less than 15 students per group. Therefore, this is a type of session in which there is space for a great amount of autonomous work by the student, supervised by teacher, who can personally follow each student's progress.
- **Group tutorials:** these are sessions conceived also for smaller groups, as lab lectures. They consist of a periodical meeting with the teacher to analyze the students' learning progress by solving doubts, underlining particular ideas which could remain unclear, or organizing focus groups to discuss about a certain problem.

For each degree, and for each subject, the distribution of expository, practice and lab lectures and group tutorials varies. Therefore, it is not possible to give a general overview. Even within the same degree, there are great variations from one subject to another, depending on the content and the needs of lab using.

New methodologies of university courses at the University of Granada

The Master Degree in Maths Education, is a semi-virtual program. María Cañadas and Antonio Moreno are teachers of this Master. Moreover, María is its coordinator.

The students of this master can choose to study face to face or virtually. We will focus here on the virtual modality and, particularly, in methodological aspects. First of all, we have to mention that we have students that are able to follow the sessions synchronically and others a synchronically. In what follows, I mention some of the main resources that the teachers and students use to communicate and share information among us.

- **E-Learning platform:** UGR uses the E-learning platform (Moodle system) for sharing information (documents, videos, etc.) or communicating with each other (between students or students-teacher) through forum. Each course of the master has its own space coordinated by the professor(s) responsible of the course. Also there is a general space for all the students and all the teachers for sharing information and communicate. Teachers use forum to promote debate between students. They also offer assistance to students through Skype or equivalent systems.

- **Video system:** These are sessions through videoconference (Adobe Connect) that are video recorded and shared through the platform. There is a specific audio and video system in the room where the sessions are developed and that allows a good audio and camera quality.

There is a platform to develop the session virtually: Adobe Connect or equivalent. Students studying the master virtually synchronically can attend the sessions, to other students' presentation or doing their own presentations.

- **MOOC :** MOOCs for teachers and students. We use for these kinds of courses, a virtual platform, we record different sessions in specific spaces, we design different tasks considering the possible responses.

Teachers' pedagogical, psychological, methodological, and English language education at the University of Granada

All university graduates in Spain finish their undergraduate education with a B1 degree in English, which ensures a minimum knowledge in that language. The university offers different training experiences for teachers to have a higher level of knowledge but it is not mandatory.

The Faculty of Education has departments of Didactics of Mathematics and Experimental Sciences with a long tradition in teaching and learning methods in scientific areas.

The new teaching staff of the UGR and scholarship holders and researchers are prioritized for the realization of a course of initiation to university teaching. This course is organized by the Quality, Teaching Innovation and Prospective Unit of the University. This course is highly valued for the professional promotion of university professors.

Teachers' training

At the University of Granada there is a specific unit that deals with teacher training: The Quality, Teaching Innovation and Foresight Unit of the University of Granada. It associates the processes of teacher training and innovation, responds to the training and innovation needs of the teaching staff of this University and is committed to a dynamic teaching style, capable of adapting to different scenarios and based on participation, reflection, teamwork, research and entrepreneurship. It is oriented to the development of teaching skills and competences demanded by the current university roles and scenarios of teaching and learning; knowledge, skills and attitudes related, among others, to the diagnosis and evaluation of students, planning, management and evaluation of teaching and learning processes and tutorial action. Competencies that consider entrepreneurship, inclusion, internationalization, digitalization and virtualization of teaching, research, communication and transfer, sustainability, academic integrity and teaching welfare in teaching practice.

Within this unit, there are different courses, both face-to-face and virtual, whose objective is teacher training. In the following website you can consult those designed for the last academic years.

<https://calidad.ugr.es/areas/formacion-innovacion-docente/formacion>

In the University of Granada there is a program for initial university teachers training, which is devoted to teachers who have less than 10 years of experience at the university.

It is organized into three phases: (a) the first phase consists of 72 hours of a face to face teaching period where experienced teachers share with novel teachers their knowledge and experiences, (b) the second phase is a distance learning phase of 108 hours, and (c) the third phase is a mentorship period of 20 hours in which each new teacher is assigned to a senior teacher.

In the first phase, the contents are about designing teaching plans, professional ethic, teaching methods, ICT, teaching assessment, tutorial, transfer, and designing a teaching project. In the second phase, the teachers in training must do activities concerning the contents in the first phase. In the third phase, the teachers in training participate in a process of clinical supervision, where each of them are assigned to a senior teachers. They make two reciprocal observations; they record mentor-senior teacher and new teacher. They also participate in three seminars: one for analysing without audio,

second for analysing the video with audio; and third reflection on the whole process. Finally, mentors have to make a report about the process with the new teacher assigned.

Methodological material, and English involved in teaching practices

The materials used for the development of the subjects are not conditioned by language. That is to say, articles and manuals will be used in English or Spanish.

Regarding English, some professors teach in English in the bilingual degrees of the University of Granada. The vast majority of classes are taught in Spanish, the official language of the Spanish state.

The University of Granada has a virtual platform based on Moodle where each professor can manage the subject with his students. Most of the faculty use it to share information and to communicate with students.

Professors' attitudes and our attitudes towards using ICT

The teacher regularly uses ICT in the development of his teaching. Specifically, he uses e-mail and the PRADO platform for communication with students, slides for the presentation of content in class and shared documents for group work.

The use of ITC in teaching allows to show illustrations of higher quality, to show properties with dynamic software and to show how different mathematics software allows to approach problems in an intuitive way.

In the UGR there is the Virtual Teaching Center

(http://cevug.ugr.es/presentacion_del_centro.html), whose main aim is to promote and to strengthen the teaching through the ICT, exploring the characteristics of online teaching the training in these methodologies, and the strengthening of digital production and its dissemination through the Internet. Some services of this center are:

- UGR Virtual Campus (Prado).
- Training in teaching technologies, digital production and online tutoring.
- Massive online open courses (MOOC).
- Multimedia resources website (UGRmedia).
- Apps for teaching in mobile technologies (AppsUGR).
- Center for producing digital media, design of multimedia interactive materials.
- Support to teaching innovation and experimentation base on ICT (Innovacampus).
- Open educative resources (OER).
- Quality system for teaching in semi virtual and virtual modalities.
- Teaching in semi virtual and virtual in degrees and masters.
- Hosting solutions for online training.
- Collaboration with companies interested on online teaching.
- Assessment and analysis of nowadays and future tendencies in teaching.
- Participation in Projects and networks.

Level of cooperation between teachers and students, enthusiasm for orderly improvement and modernization of teaching

Most teachers are particularly interested in improving their teaching. Within this interest, the modernization of teaching is a constant concern. It is common for faculty to seek, and the University promotes, to increase cooperation between teachers and students through the tutorial action plan.

REPORT ON THE SITUATION OF HIGHER EDUCATION, THE APPLICATION OF PEDAGOGICAL METHODS AND ITS TECHNOLOGIES AT THE UNIVERSITY OF OVIEDO

General framework

In the University of Oviedo the initial and continuous teacher education is structured and organized by the Institute of Innovation and Education Research (INIE, in the Spanish acronym), and also supported by other bodies as the Centre for Innovation (C1NN). Despite it is an organized structure, we must underline that in their university is not mandatory to follow any teacher training itinerary. Nevertheless, since 2001 and, particularly, since 2007, different changes were introduced in the national laws about the professional career for university teaching staff. These changes started to acknowledge the initial and continuous teacher training as well as the teaching publications and innovative projects as a professional merit in the certification processes that everybody need to pass for the different positions within the university (from the initial one to full professor).

The introduction of these criteria in national regulations has pushed most of the university teachers and professors to follow such courses, especially incoming teachers since 2007 or those who want to progress from associate or assistant to full professor.

The training is organized into three different programs.

The first one is not properly a teacher training course but part of the PhD training courses. The second one is the initial teacher training program, and the third one is the continuous teacher training program.

PhD courses

During the period students prepare their PhD, they have to follow some cross-curricular courses. These courses have a wide scope, but they are mainly focused on research (methodologies, techniques, statistics, etc.).

Nevertheless, some of the courses are directly or indirectly related to teaching issues or to ICT resources. For instance, in the last years there were courses offered about software that can be helpful

for teaching (e.g., word processing, especially LaTeX, presentations, graphics and graphical design, data analysis by R, SPSS or MAXQDA, etc).

Initial teacher training

Let us briefly describe how is the access to the profession as university professor in Spain. There are different possibilities of teacher tenures before obtaining the PhD. Some students have a PhD fellowship from Ministry or Regional Ministries during 4 years, the last 2 they can get enrolled in teaching tasks (up to 60 hours/year) supervised by a senior professor. There is also the possibility of having special positions for initial teacher/research training in which during 4 years students get enrolled both in research and in teaching duties while obtaining the PhD, but these positions are hardly ever offered by universities.

Once the candidates obtain the PhD, they have to pass an external certification by quality agencies, and if they succeed, they can be hired as Profesor Ayudante Doctor, which is a tenured position for 5 years. After that, they can apply for another certification to become Profesor Contratado Doctor, which is a permanent position (kind of Junior Lecturer or Assistant Professor), or Profesor Titular de Universidad (kind of Senior Lecturer or Associate Professor), another permanent position but with an appointment as public servant. Finally, and again after an external certification, they can apply for becoming Catedrático (i.e. Full Professor). In every one of these certification processes both the quantity and the quality of the teaching experience is assessed, and, as part of this assessment, candidates should prove their training in teaching courses. Therefore, even when not mandatory, the current situation is pushing most of the staff to get enrolled in these training courses.

On the other hand, the above describe professional path is not always fulfilled, especially for the initial enrollment in different departments in which there are teaching needs (provoked by retirements or time offs) and/or graduates easily find good jobs out of University. This is happening particularly in some fields as mathematics, computer science or electric/electronic engineering. Thus, sometimes people without previous teacher training can hold temporal appointments as university teacher.

The initial teacher training program is oriented to initial tenured teachers (they have preference over other candidates) but also to PhD students with tenure tracks, recently PhD graduates with tenure tracks or recently hired tenured teachers. It is a voluntary program, but, in practice, it becomes almost mandatory as we explained above.

The program consists of a set of different diverse courses, usually non-specifically oriented to a subject, but trying to be generalist, such that they can cover most of candidates' interests. Courses are usually between 10 and 20 in-person teaching hours, and they can also include on-line work hours. The INIE offers about 30 different courses a year (with limited positions), and candidates can enroll so that if they take more than 100 hours they obtain a special certification of having followed an intensive teacher training. Otherwise, they only obtain single certifications per course followed. Performance is not scored, so that certifications only provide a Pass/Not Pass remark. All the courses are free for the students.

Regarding the topics, the program is divided into 4 blocks: awareness, planning and management, development, and assessment-dissemination-impact.

The awareness block is devoted to create sensitivity among teachers about changes in our educational system and our society and the need of acknowledge this reality. So that courses are about innovation and creativity in higher education, inclusiveness (students with special needs), professional qualification system in Europe, gender perspective in higher education, tutorship and counseling with university students, etc.

The planning & management block includes courses about how to plan and develop an innovative teaching project, what is university management, how to write an adequate teaching contract, what are the most important technological resources for innovative teaching, as well as the basic training into the Virtual Campus of the University tools. This is a platform supported by Moodle, which is used in all the courses of the University (we will provide more data later). In order to use it, teachers should follow this basic course.

There is a third block about professional development, including courses about collaborative learning, project-based learning, team working, voice control and care, oratory and oral expression, and also some specific ICT courses as the advanced level of the Virtual Campus, creation of multimedia contents (audio & video) and flipped classroom. The advanced level course of Virtual Campus is mandatory for participating in the online degrees (completely taught online).

The last block is about assessment-dissemination-impact, and it consists of a set of different courses like students' competence assessment, communication techniques, dissemination by video and television, MOOC's, teaching projects assessment, and a course which consists of classroom assessment by video recording own's lectures and then discussing with an expert group.

Every year, near 80 novice teachers enroll in this program.

Continuous teacher training

This is a program open to all the teaching positions at the University, therefore younger and older professors can share courses. It is a voluntary program, and it does not have a specific recognition in the professional career at the University, further than the acknowledgement in the certification processes we described above.

The program includes several non-specific courses, despite it is possible that a group of teachers or a department request a customize training in a specific topic. Courses are held during the academic year and they can be between 5 and 20 face-to-face teaching hours, and some other online hours. The most frequent duration is 5 in-person + 5 online hours.

The program is organized by three axes: teaching, research and technology. It offers around 2500 posts a year.

The technology axis includes courses in Virtual Campus (both basic and advanced level, as well as a course about adapted resources for students with special needs on the virtual campus), corporative software (Office 365, Excel, Access, One drive, basic and advanced levels), LaTeX (basic and advanced), image processing software (Imagej-Fiji), audiovisual resources for teaching, social networks and teaching, MOOCs, cybersecurity, etc.

The research axis consists of different courses about responsible research innovation, ethics in animal and human research and experimentation, R+D projects application and management, European projects, spin-off creation, experimental design, qualitative research (MAXQDA), writing research reports in English, presentation of research in English, etc.

The teaching axis offers courses about innovation projects, inclusiveness, creativity, sustainability, team working, active methodologies for learning, communication techniques, coaching and mentoring in the classroom, personal branding, different educative resources (social interaction, theater, environmental tools, etc.), flipped classroom and gamification by using different ICTs, lesson study and counseling, among others.

Additionally, to this institutional program, the University of Oviedo collaborates within a wider training initiative within the G9 group, which gathers 9 Spanish universities. This group offers every year an ambitious program of full online training, so that teachers from the University of Oviedo can participate in a course offered by any of the 9 universities. These courses have a wide scope: from problem-based learning to gamification, or peer learning, statistical analysis, ICT copyrights, etc.

The English-language teaching program

Our University is very concerned about the importance of offering a double path for students so that they can obtain the bachelor degree with a bilingual offer (at least 50% of the courses taught in English). This is now offered in more than 40% of our degrees, in which students can study both in English or Spanish.

Students need at least a B1 level in English to get enrolled in the program, but teachers are asked to hold a C1 level, or with a B2 level they can get certified after following at least 2 specific courses.

The University offers different possibilities for teachers to participate. There are periodical exams for certifying the English level, specific courses for preparing these exams, reinforcement courses for teachers already certified (as a continuous improvement strategy in grammar, pronunciation, communication skills, etc.) and other courses for improving the English level and plan a future certification.

Participating in this program has different acknowledgements. First, the University computes a progressively reduced increase in the teaching hours, so that the first year a course is taught in English every teaching hour computes as 1.5 hours, being reduced to 1.35 the second year, and to 1.2 the third and following years. Second, in the national certification processes it is considered as a merit to teach undergraduate and master courses in English.

Level of cooperation between teachers and students, enthusiasm for orderly improvement and modernization of teaching

In average, the teaching staff in the University of Oviedo is very concerned about the importance of using ICT in teaching and also about the use of new methodologies. Just to give an example, nowadays we have more than 7000 different courses on the Virtual Campus, which represents more than 90% of our teaching is partly or fully virtualized, using ICT support.

Moreover, every year the University opens a call for innovative teaching project (not limited to, but including, ICTs; but also considering methodological innovations). About 130 projects a year are approved, involving around 500 teachers (which is approximately 25% of our teaching staff). Projects have to pass an initial assessment, and, after concluding, another final one, so they are quite demanding.

All the courses within the initial and continuous training are assessed after finishing them, and, in general, they obtain quite good scores about users' satisfaction. Also, students have to assess every year all their teachers, so that there some questions in the questionnaire regarding the use of ICTs

and the teaching methodology. Therefore, as teachers, we have a continuous assessment of our duties. Students usually acknowledge teachers' efforts for renewing their methodology and incorporating ICTs.

REPORT ON THE SITUATION OF HIGHER EDUCATION, THE APPLICATION OF PEDAGOGICAL METHODS AND TECHNOLOGIES AT THE UNIVERSITY OF GHENT

General framework

The Belgian constitution guarantees fundamental school autonomy: the government can only define the general directions of the actual educational system (e.g., final competences), but is not allowed to define how the curriculum is developed, implemented and evaluated. This results in a relative large variation in educational curricula.

In addition, teacher education in Flanders (the Dutch speaking part of Belgium) is different pending the educational level: junior versus senior high schools. The former teachers get their training in Professional Higher Education Institutes. The latter get their training in university settings.

Ghent University belongs to the Flemish Educational system. Since 1983, Belgium is a federal state with education being a community policy subject. This results in large differences in educational systems between Flanders, the French speaking and the German speaking community. What is being described here only applies to the Flemish educational system.

Teachers' pedagogical, psychological, methodological, and English language education at the University of Ghent

All students attain at least a B2 TOEFL level in their English language mastery at secondary school level. As far as the teacher education is concerned, the formal list of Teacher Competences is very clear about what student teachers should attain by the end of their teacher education. The 10 functional sets of competences clearly refer to pedagogical, psychological and methodological topics. The list of competences is a formal list defined by the government (October 2007; <https://www.vlaanderen.be/publicaties/een-nieuw-profiel-voor-de-leraar-secundair-onderwijs-hoe-worden-leraren-daartoe-gevormd-informatiebrochure-bij-de-invoering-van-het-nieuwe-beroepsprofiel-en-de-basiscompetenties-voor-leraren>):

- i. The teacher as supervisor of developmental and learning processes
- ii. The teacher as educator
- iii. The teacher as an expert of specific content
- iv. The teacher as organizer

- v. The teacher as innovator and researcher
- vi. The teacher as partner of parents or caretakers
- vii. The teacher as partner in a school team
- viii. The teacher as partner of external colleagues
- ix. The teacher as a member of the larger educational community
- x. The teacher as a cultural participant

The former is the base for institutional designs of their curricula that can be different. They will always incorporate pedagogical, psychological, methodological components since these are assumed in the competence framework. The pedagogical content is pursued in line with teacher competence ii. The methodological content is pursued via competence i. and iii. The psychological content is pursued in courses linked to the competence ii. All content can be focused upon when pursuing competence v. that is related to innovation in teaching and learning. In the following picture we represent the course structure along the 6-semester program of a typical PHEI. In the picture course labels have been translated. (<https://www.arteveldhogeschool.be/opleidingen/bachelor/educatieve-bachelor-secundair-onderwijs/welke-vakken-krijg-je/ondersteunende-vorming>).

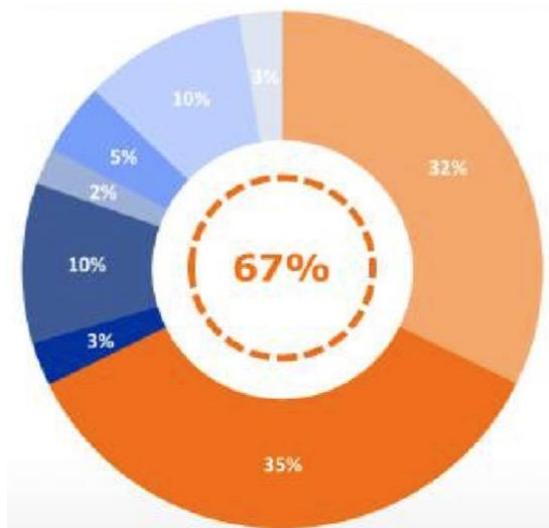


The quality assurance agencies and accreditation organizations focus – when reviewing teacher education programs – the extent to which these competences are being pursued and attained. Each teacher education institution is completely free in the way they implement their teacher education, approach to pursue and attain the competences. There is no prescribed curriculum, internship model, list of courses, assessment approach, standards attainment assessment. Teacher education diplomas are awarded by the teacher education institutions; building on their accredited programs.

Assessments of teachers' weakly engagement in realization of teaching, preparation classes, individual work with student and other activities.

Teachers' workload has been a hot item in the Flemish educational context; especially due to a high level of teachers dropping out of the school system. The Minister of Education set up a research study involving teachers from primary and secondary education (see <https://www.google.com/search?client=firefox-b-d&q=werkbelasting+leraren>). Based on a logbook methodology and involving 9596 teachers. The large-scale study revealed for the first time in the Flemish school system the actual workload. The following results could be obtained (focus on secondary school teachers):

- Average workload in secondary education is 41 hours 50'; when calculated over a full year.
- During lesson weeks, the workload is 47 hours 59' per week.
- 32% of the weekly time is used lesson preparation and correcting student work.
- 35% of the time is used for teaching
- 10% is used for professional collaboration (team meetings).
- 10% is spent for school organizational and policy support tasks
- 5% for classroom administration
- 3% for professional development
- 3% for individual student guidance
- 2% is spent for supervision tasks at school level



Minnen, J. & Verbeylen, J. & Glorieux, I. (2018). De taakbelasting en werkcontext van leraren. Onderzoek naar de tijdsbesteding van leraren uit het basis- en secundair onderwijs. Department of Sociology, Research Group TOR, Free University Brussels. Retrieved on October 15, 2019 from <https://www.google.com/search?client=firefox-b-d&q=werkbelasting+leraren>

Teachers' training regarding the use of ICT

Teachers in compulsory education classes – *up to junior high school* – receive their formal training in Professional Higher Education Institutes (PHEI). During their training they ‘might’ receive an introduction to learning management systems, educational technology applications.

For the structure of a typical related teacher education program, see

<https://www.arteveldehogeschool.be/opleidingen/bachelor/educatieve-bachelor-secundair-onderwijs/welke-vakken-krijg-je/ondersteunende-vorming>).

Such a program always introduces all teachers to “Research and multimedia”. This consists of 6 practical hands-on workshops – set up in small groups - about ‘didactical tools, ‘image and sound’, ‘social media in the classroom’, ‘digital learning platforms’, ‘the digital class’, and ‘research’. Their overall educational program is supported with a learning management system.

When it comes to *senior high teachers*, the situation is different. They are trained at universities where they get a master’s degree in their subject + an additional teacher education master or they follow an educational master degree that from the starts integrates the subject domain with teacher expertise. In their program they get an introduction to IT and multimedia via: (a) the general course Powerful Learning Environments and (b) the two specialized didactics in their subject domain.

When it comes to *teachers in higher education*; e.g., universities. The situation is again different:

- Universities hire staff on the base of their “merit” as screened during the application procedure. In the Flemish system, this merit is based on a combination of their research, teaching and service-capacities.
- The former implies that the capacities of starting teachers is not comparable and depends on their education and experience.
- Once they are being hired there is the formal expectation of being involved in professional development. This is part of their “personal development plan” that is being evaluated every two and four years. In this plan, individual teachers can put forward their ambitions in view of – among other fields – teaching. Teachers are explicitly expected to develop their teaching capacities. This is also evaluated on an annual base through student interviews.
- There is a very developed professional development “menu”, consisting of supply-driven, demand-driven, and project-driven professional development offers. The project-driven reflects a priority that is being put forward for all teachers. At this moment this is “ACTIVO: Active learning”. This project embraces, structural, organizational and procedural innovations to guarantee that all teachers in all faculties and (undergraduate) programs are being trained (see slides).

Methodological material, and English involved in teaching practices

At Junior and senior high schools, by law, schools can decide to offer part of their program in a foreign language, such as English.

This builds on the CLIL format (Content and Language Integrated Learning) that is a method in which French, English or German is used as the Language of Instruction to teach a non-language subject. CLIL can be used at all stages and in all types of secondary education.

- A maximum of 20% of non-language lessons (max 5 periods/week) can be taught in CLIL;
- The school should develop an explicit policy to improve the level of Dutch for all pupils and have a coherent general vision and strategy for language development;

- Realizing the objectives of the non-language subject's learning plan is essential;
- The school must formally approve every individual pupil starting a CLIL project and pupils must commit themselves to remaining a full year in CLIL;
- Teachers need to certify their CEFR - C1 for all skills in the target language or have a Bachelor or master's degree in that language AND be competent in the CLIL method;
- Pupils who do not take up CLIL must be able to choose for a parallel group, where the non-language subject is taught in Dutch;
- The school must clearly communicate all conditions of the CLIL-project to parents, esp. regarding commitment, assessment and the existence of a parallel group;
- Statutory rights of teaching staff must be respected: not accepting a CLIL-assignment for a teacher cannot be a cause of sanctions or change of assignment;
- The school must have planned a method of quality control, monitoring pupils' progress in the non-language subject, the CLIL-language and Dutch;
- The school's formal application must be submitted to and approved by the Ministry of Education.

More than 100 schools adopted the CLIL approach. 50% of the schools choose English as the key second language; the other mainly French or German.

As far as the University teachers are concerned:

- Teaching in English through English as a Medium of Instruction is NOT central to higher education policy in Flanders.
- By law (decree), only 6% of Bachelor programs and 35% of Master programs can be in English. In addition, for each English language program there has to be a Dutch language alternative.
- English is as such only used in 2,8 % of the courses: 1,85 % at bachelor and 21,5 % at master's level.
- When university staff wants to teach in English (or whatever other language) they need to obtain an official language mastery certificate (minimum A1 TOEFL level).
- At Ghent University – November 2019, 33% of the 7073 courses is being taught in English. 23,8% of the 458 programs, is being taught in English .
- 11% of the 3170 teaching staff members at Ghent University, are with a foreign nationality and teach in English.

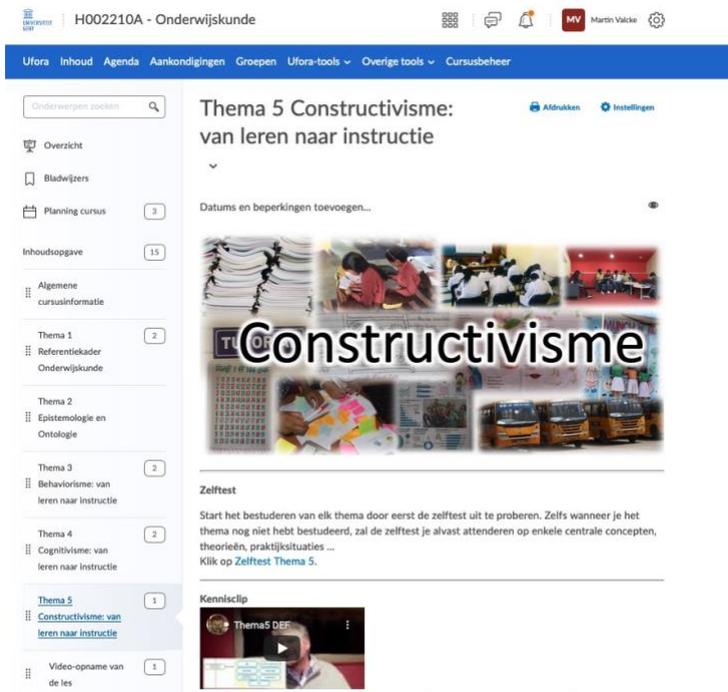
Schools' attitudes towards using ICT

About 97% of secondary schools apply an online learning platform. 80% of them use the system Smartschool (<http://www.smartschool.be/doelgroep/secundair-onderwijs/>).

The application fosters mainly a shared agenda, exercising, student tracking system, report functions, links to external apps, homework application, integration of textbooks from publishers.

Every higher education institution has implemented a learning management system that is fully integrated with their student, staff and course database.

At Ghent University, teachers deliver their courses on the university wide implemented electronic learning platform. There are no exceptions; the use is mandatory. Since 2019-2020, there is a new platform, called Ufora, based on the Brightspace environment. The next figure gives a screenshot of the UGent Ufora system that integrates ppt, knowledge clips, online assessment, agenda, message, collaborative work space, etc.



There has been a university wide training program with offers for individuals and teams to switch all courses to the new environment.

The use of Ufora is central to the professional development approach and is being supported through supply-driven, demand-driven, and project-driven professional development offers.

The Activo project pushes the adoption of active learning strategies at undergraduate level (large groups of students). This all-embracing program (see separate ppt) has at its core the use of the Ufora system; see screenshot of the Activo-project page:

Activerend Leren

De UGent zet volop in op "activerend onderwijs" in haar onderwijsbeleid. "Actief leren" is een basiskenmerk van elk kwaliteitsvol onderwijs dat studenten in de breed scala aan competenties wenst op te leiden. Bovendien hebben actuele uitdagingen in het UGent onderwijs actief leren nog prominenter naar voor geschoven.

Op het Bestuurscollege van 20 maart 2018 werd het voorstel goedgekeurd om de centrale onderwijsinnovatiemiddelen van 2018 aan te wenden om een didactisch projectteam (het zgn. ACTIVO-team) samen te stellen dat samen met het UGent onderwijsprofessionaliseringsteam opleidingen en lesgevers zal begeleiden om geschikte activerende onderwijs- en leeractiviteiten, passende (permanente) evaluaties en efficiënte vormen van feedback in het onderwijs in te bouwen.

Op de Onderwijsdag van 18 mei 2018 is dit project voorgesteld en kregen de deelnemers al een voorsmaakje hoe ze op een kleinschalige en op meer uitgebreide manier studenten kunt activeren.

→ [Download de presentatie](#)

Meer weten

Wil je meer informatie over dit project?

Ga naar <https://onderwijstips.ugent.be/nl/tips/activerend-onderwijs-aan-de-ugent-het-activo-proje/> of neem contact op met activerendonderwijs@ugent.be.

All teaching staff gets a training offer in view of the adoption of blended learning that is considered the corner stone of the teaching and learning approach at Ghent University (<https://www.onderwijstips.ugent.be/tips/blended-learning/>).

At regular moments special innovation days are being planned:

<https://www.ugent.be/nl/univgent/waarvoor-staat-ugent/kwaliteitszorg/onderwijsdag2019.htm>

Professors' attitudes towards using ICT in teaching

When it comes to the use of the learning management system; there is NO choice; Every teacher, for every course has to use the Ufora system since this is the formal teaching and learning 'channel' in the educational system.

As such, the attitude of teaching staff does not really matter.

At least each two years, the teaching and learning approach for each course is being evaluated on the base of student questionnaires. This questionnaire focuses on teaching approaches (e.g., collaborative learning, field work, embedded research, student input...), use of innovative technologies, ... The concrete results of the evaluations are private property of the individual staff members and are discussed at program level.

The outcomes of student based evaluations is the starting point for a course redesign: see <https://www.youtube.com/watch?v=THdNUoeZEoE>

The results of the student evaluations are input for a tough redesign process of which a large part focuses on teacher professional development. In the following example we see the homepage of the "quality cell" of the faculty of Medicine and health sciences.

Cluster onderwijskwaliteitszorg & -innovatie

De Facultaire Dienst Onderwijsondersteuning (FDO) ondersteunt de opleidingen in de faculteit bij het uitwerken en optimaliseren van hun onderwijskwaliteitszorg- en onderwijsinnovatiebeleid.

Om tegemoet te komen aan de universiteitsbrede onderwijsvisie "Creatieve kennisontwikkeling" gaan onderwijskwaliteitszorg en onderwijs innovatie hand in hand.



Kwaliteitszorg

De cel onderwijskwaliteitszorg en -innovatie werkt beleidsondersteunend t.a.v. de faculteitsraad op vlak van onderwijs. De cel bereidt beleids- en adviesstukken voor en geeft also het facultair onderwijsbeleid mee vorm.

Daarnaast staat de cel ook in voor het monitoren van de facultaire kwaliteitszorg inzake onderwijs en ondersteunt en begeleidt opleidingen en lesgevers bij de kwaliteitsbewaking en -verbetering van hun onderwijs.

De faculteit hanteert daarvoor het MOVINGG-model (model voor onderwijskwaliteitszorg en -vernieuwing in de Geneeskunde en Gezondheidswetenschappen) dat vorm kreeg in het [MOVINGG-handboek](#).

Het [onderwijskwaliteitsverbeterplan 2018](#) licht de facultaire visie rond onderwijskwaliteitszorg toe.

Dienstverlening voor opleidingen

- Advies en begeleiding bij opleidingsspecifieke kwaliteitszorg
- Ontwikkeling en organisatie van evaluaties met betrekking tot het onderwijs en focusgroepen
- Ontwikkeling en organisatie van de evaluaties bij stakeholders betrokken bij onderwijs
- Bevragingen met betrekking tot het onderwijs op maat van de opleiding
- Monitoring en ondersteuning van kwaliteitszorg binnen de opleidingen via jaarlijkse overlegmomenten

The results of the quality review in this exemplary faculty resulted in a training offer in view of:

- Innovative assessment approaches
- Language support for students
- Prevention burnout and suicide in students
- Use of learning analytics
- Peer tutoring
- Innovative master thesis support
- Motivating ways of teaching
- ...

To give an estimation about university teachers attitudes, the following is based on our contacts with teaching staff; no hard evidence can be put forward; percentage refer to the % of staff adopting a positive attitude and willing to implement this in their learning and study environment:

- attitudes towards using ICT in teaching: 100%
- group work: 60%
- modern software capabilities: 80%
- students' presentations: 50%
- discussion with students: 100%

The former is a difficult exercise since this depends on the specific learning goals of a course, it differs depending a bachelor or master level course, it differs between programs within and between faculties; it differs depending on the number of students in a course (session).

Our attitudes on the use of ICT in teaching

I am one of the key developers of online learning in higher education in our context. As such, there is no doubt that I am a strong advocate of – grounded – usage of IT in education. It all is related to the nature of the learning objectives. As such, I am not a fan of 100% eLearning, but a big fan of blended learning. This is also the approach embraced by our university.

I push the use of eLearning solution especially in view of ‘quality’ since it obliges teachers to be very structured, organized and transparent in what they have to design and develop before the actual teaching process. Since we teach in a university where we have to work with large groups of students, new technologies help to enhance and support communication, distribution, collaboration, interaction ...

In view of critical thinking and transferable skills ... This all depends on the nature of the learning objectives that are stressed in a course and the way in which new technologies might support the related instructional strategies. This does NOT depend on the media being used, but on the instructional strategies being implemented that might be supported with new technologies.

Level of cooperation between teachers and students, enthusiasm for orderly improvement and modernization of teaching

Student teacher collaboration is lower at bachelor level and large at master level. Cooperation can be small or large; e.g., in view of internship or master thesis activities, there is a one-to-one relationship. In many cases, cooperation depends on the phase in the learning process; e.g., there is a strong interaction when feedback moments are being organized (up to 2 times in a semester).

REPORT ON THE SITUATION OF HIGHER EDUCATION, THE APPLICATION OF PEDAGOGICAL METHODS AND ITS TECHNOLOGIES AT THE UNIVERSITY OF BANSKA BYSTRICA

General framework

Matej Bel University in Banská Bystrica (Slovak Republic) is one of the leading national universities. It was established in 1992 and currently it consists of the following faculties:

- Faculty of Natural Sciences
- Faculty of Philosophy
- Faculty of Economy
- Faculty of Law
- Faculty of Education
- Faculty of Political sciences and International relations

Due to the contents of the project we concentrate ourselves to the area of mathematics, computer science and natural sciences.

Structure and basic data of the Faculty of Natural Sciences

The faculty was established in 1995 as a result of division of the former Faculty of Humanities and Nature science into faculties of humanities and nature science. It consists of the following departments:

- Department of Mathematics
- Department of Computer Science
- Department of Physics
- Department of Biology
- Department of Chemistry
- Department of Environmental Sciences
- Department of Geography and Geology
- Department of Technical Sciences

It offers bachelor, master and PhD studies in the above topics as well as teacher training in combination of two subjects. It has 94 academic employees and over 600 students in internal study and about 50 students in external studies. The study programs accredited and offered by the faculty are the following:

Bachelor degree:

- Forensic and Criminalistic Chemistry
- Applied Geology
- Geography
- Environmental Safety
- Ecology and Protection of Ecosystems
- Mathematics
- Applied Computer Science
- Teaching (combination of 2 subjects)

Master degree:

- Applied Chemistry and Forensic Practice
- Applied Geology
- Geography and Regional Development
- Environmental Management
- Ecology and Protection of Ecosystems
- Mathematics of Data Analysis and Finance
- Teaching (combination of 2 subjects)

Doctoral degree:

- Geochemistry
- Evolution of Ecosystems and their Protection
- Remediation of Environmental Burdens
- Mathematical Analysis
- Theory of Physics Education

The number of students in particular programs in the academic year 2018/19 is in the following table:

Degree	Form of study		Total
	Internal	External	
<i>Bachelor</i>	383	47	430
<i>Master</i>	198	30	228

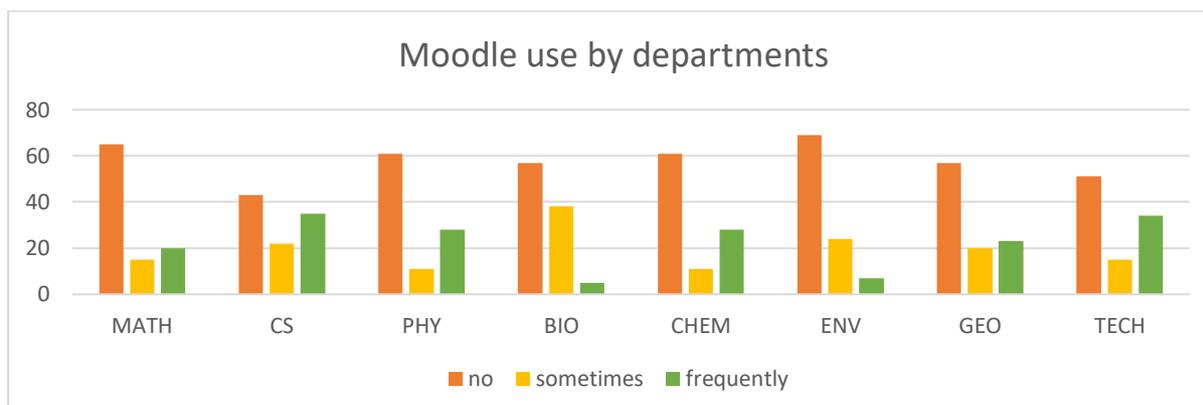
<i>Doctoral</i>	20	5	25
Total	601	82	683

The education follows the standard system used in Slovak Republic, i. e. classical face to face education with average number of 24 lessons in Bachelor degree and 20 lessons in Master degree, with the exception of the last semester, that is mostly devoted to the preparation of the final thesis. The amount of the lessons is approximately equally divided among lectures and seminars. In the educational study programs at the Master level a considerable share of lessons are devoted to practical placement at elementary or secondary schools.

Technical means for education

Thanks to the participation in previous project and institutional support all students and employees had access to computers connected to internet, including access to scientific databases, like ScienceDirect or WoS. All the departments possessed computer laboratories available also to students' individual work.

The major tool for the online support of education was the Moodle software, as the university standard. In the internal study programs, however, there were no subjects taught exclusively by Moodle, but it served to different levels as a complementary method of teaching. No other tools of online education, like MS Teams or Google Meet were used.



The table above shows the percentage of subjects delivered by particular department in Moodle which is used as a complementary tool, it is not the principal method of education.

Human sources

The number of teaching staff at Faculty of Natural Sciences is 99. The following table shows numbers of staff members who graduated in particular scientific disciplines, i.e. not in educational programs (group A), and those who graduated in education (group B).

Department	MATH	CS	PHY	BIO	CHEM	ENV	GEO	TECH
A	7	3	3	4	5	8	2	9

B	5	12	5	9	10	1	13	3
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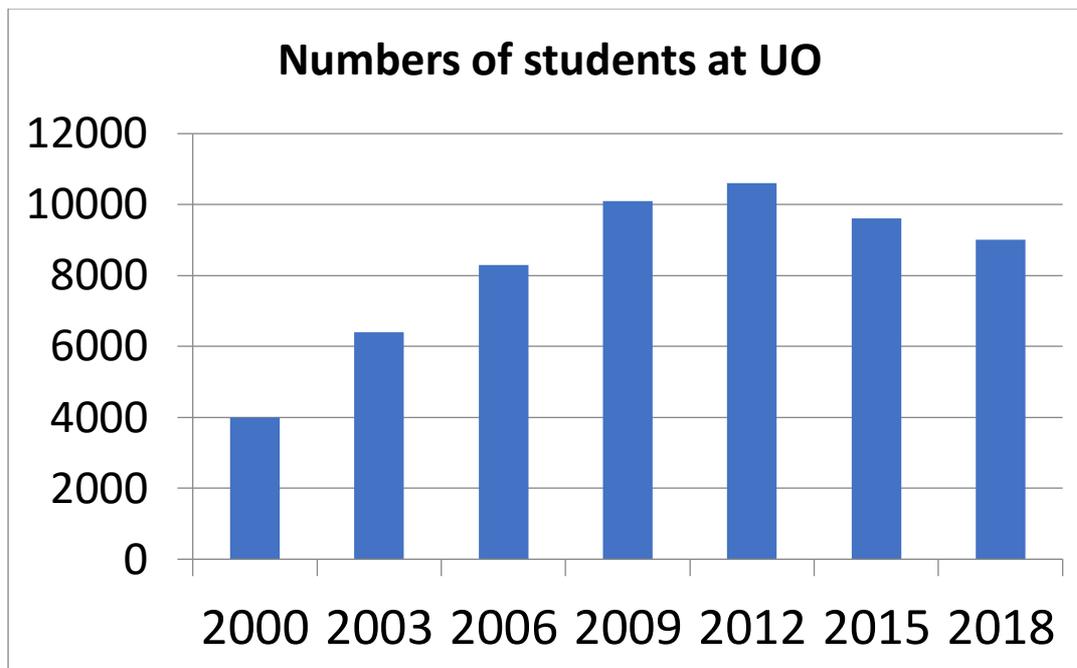
As the table shows, the number of staff members graduated in education (58) is slightly higher than the number of graduates in particular subjects (41). Experience shows that this ratio is suitable for education in teacher training as well as e.g. advanced postdoctoral studies in mathematics, biology, chemistry, etc. Therefore, the long-term aim of the personal management is to maintain approximately equal share of the both groups.

REPORT ON THE SITUATION OF HIGHER EDUCATION, THE APPLICATION OF PEDAGOGICAL METHODS AND TECHNOLOGIES AT THE UNIVERSITY OF OSTRAVA

General framework

The University of Ostrava was established in 1991 with three faculties (Faculty of Education, Faculty of Arts and Faculty of Science). In 1993, the Faculty of Health and Social Studies was founded. In 1996, the Institute for Research and Application of Fuzzy Modelling was founded. In 2008, the Faculty of Social Studies was founded and the Faculty of Health Studies was transformed into the Faculty of Medicine.

The University of Ostrava has become a significant educational and research institution, which also emphasises the so-called third role of a university: social role. It is an important player in the field of social and cultural events in Ostrava and across the region. It directly takes part in organising events for the public (for example, Ostravská Noc vědců, Jsme Ostravská!, etc.) as well as through students, graduates, and academics. The cultural spectrum is thus enriched by university diverse and sophisticated impulses.



The research staff at the Institute for Research and Application of Fuzzy Modeling, who is engaged in the ERASMUS+ project, primarily participates in the education of students from the Faculty of Science. The following shows the structure of the Faculty of Science.

Teaching in English

All faculties of the University of Ostrava (UO) offer education of selected courses in English. The education is mostly supervised by junior pedagogues (less than 12 years of practice) as well by senior pedagogues (12years+ of practice) as most of them experienced their studies in English. In addition, the UO offers its employees the possibility to regularly take part in courses of English. Within the ERASMUS+ programme, the UO is a destination for foreign students. Most of pedagogues prepare individual education for these students in English. The UO also offers job positions to foreign pedagogues through open selection procedures. Consequently, some courses are taught in English and certain faculties and research institutes hold regular scientific seminars in English with invited foreign guests. The following table provides an overview of programmes offered to students in English.

Bachelor's Degree Programmes		
English Philology	3 years	B2
Mathematics	3 years	B2
Master's Degree Programmes		
English Philology	2 years	C1
General Medicine	6 years	B2
Mathematics	2 years	B2
Doctoral Degree Programmes		
Mathematics	4 years	C2
English Philology	4 years	C2

Pedagogical education

Generally in the Czech Republic, university pedagogues do not have to have pedagogical, psychological, and methodological education to be able to teach in the higher education sector. That is why only some pedagogues had this education during their formal education, primarily the teachers of the Faculty of Education, who had to undergo this education obligatorily. Starting point for educational work in natural sciences, especially mathematics, in Czech Republic, in almost all schools is learning method of Milan Hejny. Hejny is Czech and Slovak mathematician, an expert in didactics of mathematics, a professor at the Pedagogical Faculty of Charles University in Prague. Hejny's method is based on non-traditional way of teaching mathematics and its basic principles are: Building Schemas, working in environments, interlinking topics, character development, growth of motivation, real-life experience, enjoying mathematics, development of personal knowledge, working with errors, appropriate challenge and supporting cooperation. The method was adopted by more than 750 of the 4100 Czech schools on the primary and lower-secondary level, as well as in a range of alternative schools and in home-schools.

All university professors who teach theoretical subjects (boring for students), are challenged to make an abstract subject for non-theoreticians (not central to their field of study), specially, although available Czech textbooks are purely technical and axiomatic, old-fashioned and non-modern. They have much success in motivating students to learn theory in a more interesting and practical way, through concrete projects. In such way students do not dislike theoretical subjects in the field of natural sciences, they are more interested and they acquire necessary knowledge in that area. Teachers use some of the following strategies: arrive at interesting topics as soon as possible, motivate the concepts by intriguing notions through concrete practical examples, proceed from the familiar ideas to abstract terms...

Quality feedback – students

The area of the quality feedback to the educational activity was significantly changed in 2018 by modifying the quality feedback questionnaire. In 2017, a working group for evaluation of the quality of education was established. In 2018, it submitted a proposal to modify students' evaluation. The proposal was based on state-of-the-art research works in the area of evaluating the quality of education in the university environment.

The students, therefore, anonymously answer several questions in the questionnaire regarding the education (teacher's approach, quality of lectures, educational premises, schedule, etc.) and they can also comment on it. They can point out teacher's weakly engagement in the realisation of teaching. The results are made public on the UO website, then discussed with the vice-deans for studies and then solved at individual faculties. It is the opportunity for the UO employees to get feedback, think over it, and in case of critical comments to launch a process of changes or to confirm the correctness of the content and the form of their teaching. Each evaluation is a step and effort to improve the educational activities at the UO. The evaluation result assessment from the past years has already led to a number of improvements. For instance, technical equipment of several classrooms has been

renewed, there are new portal applications, courses have been innovated, and several teachers changed.

In 2018, the University of Ostrava also received feedback from its graduates through their participation in the national survey Absolvent 2018 as well as a European one – Eurograduate. The questionnaires were open for the graduates from October to December and the University of Ostrava addressed 7,997 graduates in total; graduates from 2013-2017. With respect to the time of the survey, the results were not published in 2018, which is expected in the second half of 2019.

Another target group to provide its feedback to the University of Ostrava were students of the 1st year of 2018 across all study programmes. This questionnaire survey was focused on the quality of information about the offer of study programmes at the University of Ostrava and the way how the students learned about the University of Ostrava. The survey was actively taken by 803 students of the 1st year of all study programmes (the questionnaire response rate was 23 %). The main finding was that an overwhelming majority of the students considers webpages as the key source of information about the university. Based on the questionnaire survey results, works to improve the information provided on the university website were initiated to be ready to serve the entrance examination procedure in 2019.

Quality feedback – employees

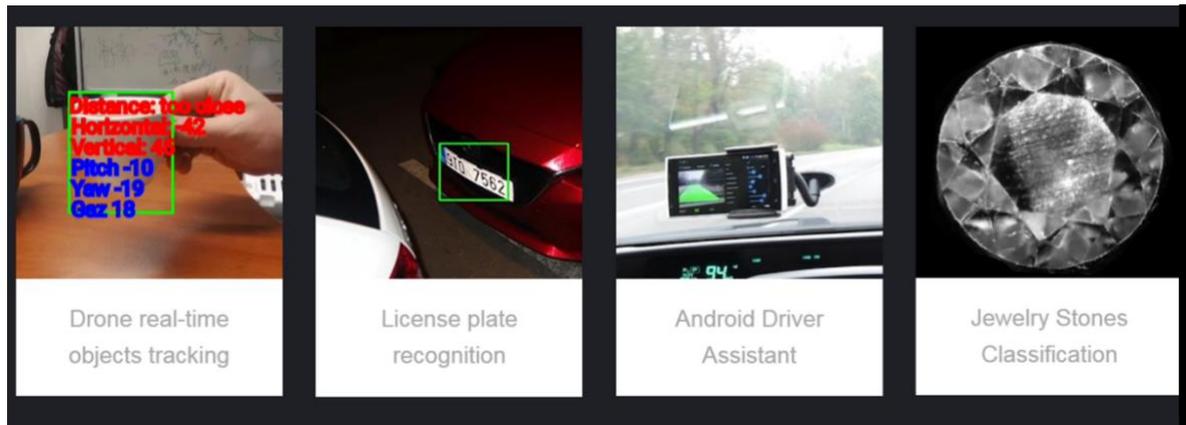
Regarding the quality feedback in the area of services for employees, the University of Ostrava held a vast survey among all employees in 2018. The survey had a form of an electronic questionnaire and it was anonymous. The response rate was 60%. The questionnaire was primarily focused on the quality of working conditions for individual groups of employees, ethical aspects, knowledge and support of the university strategy, employees' benefits, wage conditions, etc. Based on the survey results, an action plan for further steps has been prepared. The plan covered the area of improving the conditions for employing research staff within the preparation for HR Awards acquisition. Other measures included a proposal of a new internal wage regulation (academic and non-academic staff wage tables have been merged), finalisation of the proposal of the Career Regulation and Labour Regulation, which modified the procedure of settling conflicts between employees, etc.

Technical means for education

The full-time and distance form of studies at the UO are supported by the possibility of on-line courses (Moodle) available on the UO website. Moodle is developed as a tool enabling to realise educational methods, support easy publishing of study materials, create discussion forums, collect and evaluate electronically submitted assignments, and create on-line tests and presentations.

At the Faculty of Education, there is a new Department of ICT, which focuses on the issue of ICT in education. It deals with the area of personalised education, eLearning, multimedia, mobile devices, and social networks within the framework of being used in education. They are working with robots, planning their behaviour with applying their knowledge in physics and mathematics, predict the trajectories of SPHERO robot, work on multidisciplinary projects (biology and informatics, mathematics and physics etc.)

The approach of the pedagogues to the use of ICT in education is positive. Therefore, they support students in teamwork and actively engage them in the educational process, e.g. through student presentations and subsequent discussions.



ICT teaching supports the students in creative thinking, development of informatics thinking as well as prepares them for practice. The students are more open and communicative with their surroundings; therefore, they find the use of ICT in education interesting and entertaining.

Conclusion:

Just as with many survey results those obtained herein should be considered with a caution. We looked at only several institutions 4-5 from 3 different EU countries and within this poll of results we noticed some differences in practices. Therefore, it would be wrong to conclude that what is presented herein is representative of the HE practices across Europe. Having said that, the obtained information is significant and has some significant correlations between different institutions. This gives us the opportunity to use data, compare the surveys conducted in partner countries (Serbia and Albania), make comparisons and suggest/set project specific outcomes.

EU HEIs are defined by great effort and some success in using e-learning and OESs. Survey results point out that EU HEIs are prepared and to great extent equipped with necessary skills and tools to advance in teaching of necessary methodological skills in usage of novel procedures. However, it is evident that the majority of educators in HE sector define time as the crucial limiting factor in order to advance their personal skills and knowledge. This is important factor when discussing HE transitions and new developments.

Students often “mimic” their lecturers, when online learning is concerned. We didn’t see a significant increase in the use of technology driven learning between staff and students. Both groups tend to use a mixture of different e-learning tools, less time consuming (e-books, pictures) vs. long and static (simulation, web-conference). However, modern methodological and pedagogical tools are much more implemented in teaching and learning in EU than in PC HEIs.

Annex I Examples of questionnaires

QUESTIONNAIRE FOR BSc/MSc/PhD STUDENTS

We would appreciate if you could spare 15 minutes of your time to fill in this questionnaire. Results of the questionnaire will be used to improve instrumental analysis education by the implementation of new instructional tools within the Erasmus+ project "Strengthening Teaching Competences in Higher Education in Natural and Mathematical Sciences" 598434-EPP-1-2018-1-RS-EPPKA2-CBHE-JP, TeComp.

Thank you!

Gender: Male Female

You are: a) BSc student b) Masters student c) PhD student

1. Assess your knowledge and skills in using the following software:

	software	knowledge/skills			
		none	undeveloped	average	excellent
1.	Software/Applications tools for teaching and assessment				
2.	LMS				
3.	Web-conferencing software				
4.	Remote Desktop Control software				
5.	statistical data analysis software				

2. Do you use an IT classroom in your institution?

- a) yes
- b) no

3. Can you use computers in the library?

- a) yes
- b) no

4. How often do you use the following Open educational softwares (OESs) during teaching?

OES	never	occasionally	often
scientific papers (open access)			
printed publications (books, journals) (open access)			
e-books/e-textbooks			
other electronic textual material (brochures, presentations, promotional materials)			
pictures/animations			
videos			
forums and other forms of online communications			
webinars			
online courses at internet			
Web-conferences			
Databases			

5. Do you feel that the usage of OES in lectures by your lecturers is:

- a) insufficient – you would like OESs to be used more frequently
- b) adequate
- c) excessive

6. Do you think that your learning is better and of a higher quality when lecturers use OES during classes or practical laboratory work?

- a) yes
- b) no

7. Do you think that your learning is better and of a higher quality when you use OES (recommended by teachers or those you found yourself) during your study?

- a) yes
- b) no

8. Do you ever consider the credibility of OERs you use?

- a) I never think about it
- b) I use the materials from reliable sources only
- c) I use resources recommended by my teachers

9. Do you use some of the following e-learning tools?

	YES	NO
Moodle platform (or equivalent)		
interactive online or offline theoretical classes		
online or offline resources for learning about the functioning and operation of instruments		
software for simulation/conducting practical work		
web-conferences		

Annex II Examples of questionnaires

QUESTIONNAIRE FOR TEACHERS/LECTURERS

We would appreciate if you could spare 15 minutes of your time to fill in this questionnaire. The aim of this study is to collect data on knowledge, skills and practice in usage of modern technologies in the field of natural and mathematical sciences. Results of the questionnaire will be used to improve instrumental analysis education by the implementation of new instructional tools within the Erasmus+ project "Strengthening Teaching Competences in Higher Education in Natural and Mathematical Sciences" 598434-EPP-1-2018-1-RS-EPPKA2-CBHE-JP, TeComp.

Thank you!

Gender: Male Female

How many years of work experience within higher educational institution have you got?

- a) less than 1
- b) 1-5
- c) 5-10
- d) 10-20
- e) 20-30
- g) more than 30

1. Assess your knowledge and skills in using the following software:

	software	knowledge/skills			
		none	undeveloped	average	excellent
1.	Software/Applications tools for teaching and assesment				
2.	LMS				
3.	Web-conferencing software				
4.	Remote Desktop Control software				
5.	statistical data analysis software				

2. How often do you use the following Open educational softwares (OESs) during teaching?

OES	never	occasionally	often
scientific papers (open access)			
printed publications (books, journals) (open access)			
e-books/e-textbooks			
other electronic textual material (brochures, presentations, promotional materials)			
pictures/animations			
videos			
forums and other forms of online communications			
webinars			
online courses at internet			
Web-conferences			
Databases			

3. I use OES: (mark all that is appropriate)

- a) during self-preparation for lectures (to get information related to my field of work)
- b) during lectures (OES included in lectures/exercises)
- c) during preparation of tests for students
- d) as obligatory literature for students
- e) as additional recommended literature for students

4. Is the quality of your lectures better when you use OES during classes or exercises?

- a) yes
- b) no

Are you involved in the joint production of OES with educators from other HEI?

- a) No
- b) Yes, in the same region/state
- c) Yes, in another part of the country

6. Are you involved in the exchange of OES with colleagues from other educational institutions for?

- a) No
- b) Yes, in the same region/state
- c) Yes, in another part of the country



How would you describe the open educational content you are producing?

- a) As full courses/programmes

8. How important are the most significant barriers to the engagement of other colleagues in the production of open education content?

	Very important				Not important
Lack of skills	<input type="checkbox"/>				
Lack of time	<input type="checkbox"/>				
Lack of hardware	<input type="checkbox"/>				
Lack of software	<input type="checkbox"/>				
Lack of computer access	<input type="checkbox"/>				

9. Do you use some of the following e-learning tools?

	YES	NO
Moodle platform (or equivalent)		
interactive online or offline theoretical classes		
online or offline resources for learning about the functioning and operation of instruments		
software for simulation/conducting practical work		
web-conferences		



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in Natural and Mathematical Sciences

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University of Niš *The TeComp Consortium*

www.tecomp.ni.ac.rs

e-mail:

tecomp@ni.ac.rs

tecomp.p2018@gmail.com

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