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European Biomedical Engineering e-Learning

Analysis and guidelines for existing and planned BME e-learning in Europe

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Report

REPORT TITLE Analysis and guidelines for existing and planned BME e-learning in Europe
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ABSTRACT This document constitutes an activity report, highlighting the policy that pervades the efforts of EVICAB members to strengthen the Bologna harmonisation process. The presented guidelines identify specific areas where e-learning needs thorough consideration in order to get the most out of its potential for e.g., student mobility and life long learning. The target group consists of the teacher and programme coordinators, responsible for education by designing courses and/ or curricula. The delimitation of the guidelines has matured and developed as consequence of the BME survey and a number of seminars and meetings in the EVICAB project. Thus, the contents of this report are adapted to the needs of the participant members although delivered in a generic manner in order to allow different implementations and to serve as a reference or starting point for any other e-learning initiative sharing the same ambitions. Iterative revisions of this document are to be expected adding, changing or clarifying the guidelines according to need and gained experiences.
KEYWORDS Course recognition, Student exchange contracts, Transparency, Student centred learning
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Introduction

The visionary initiative of 29 European countries to commit themselves to the promotion and establishment of a common European Higher Education Area (EHEA) was confirmed with the signing of the Bologna declaration the 19th of June 1999 in Bologna, Italy. The vision, sometimes seen as an unreachable utopia, has through laborious and persistent work, been broken down to concrete recommendations, guidelines and action plans adopted by the signatory countries. This transitional process, known as the Bologna process, involves political decisions and initiatives, administrative and pedagogical changes aiming at nourishing the EHEA consciousness without depriving the national or local identities of the participating educational centres. The objectives of the Bologna process is to create a common framework of readable and comparable degrees, to introduce a two cycle system of undergraduate and postgraduate, an ECTS-compatible credit systems, quality assurance with comparable criteria and methods and to promote free mobility of students, teachers and researchers. The virtual campuses enhances this effort adding objectives that is to increase virtual mobility as a complement or substitute to physical mobility and to integrate this mobility into the development of multilateral curriculum development, increase high-quality European educational resources and to modernise the European higher education system integrating information and communication technology (ICT) in daily education.

The goals of student and teacher mobility across borders, joint degree programmes and quality assurance require trust and total transparency between member countries and their educational systems. Concrete tools such as a European credit transfer system as well as publicly available outcomes and assessment criteria must be adopted and implemented in a common way facilitating the interpretation and understanding of every university programme and even every individual course.

Having the above in mind it should be clear that responsibility is shared between governments and universities from the level of institutions and authorities down to the individual teacher and student. From the teacher's perspective, pedagogical and quality issues have been prioritised, however, without disregarding administrative issues such as striving for recognition and encouraging student mobility through cultivating relations with other universities. Emphasis has also been placed on implementing student centred learning that is generally accepted as the best way of preparing students for their future profession[1]. Quality

awareness is the cornerstone for all activities and practical measures of quality constitute a natural part of the teaching/learning process. After all, universities cannot exist without students and students will only be attracted if the educational reputation is built on solid research and strong pedagogical bases that are subjects of continuous quality assurance.

The role of e-learning in this process has started to be appreciated[2]. The possibilities provided for student and teacher mobility is greatly enhanced and thus also the participation in other universities' programmes promoting transparency and the generation of joint degrees. At the same time new possibilities are created for the notion of life long learning and the worldwide spread of a competitive EHEA, which is one of EHEA:s ultimate goals.

The demands and responsibilities of virtual campuses are all the same as for the physical campuses when it comes to the realization of the Bologna process. They just need to be adapted to distance education practices and methodologies. This report aims at supporting the European Virtual Campus for Biomedical Engineering (EVICAB) in its effort to comply with the Bologna process directives and strengthen the harmonization of European higher education within the field of Biomedical engineering.

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Background

The project European Virtual Campus for Biomedical Engineering (EVICAB), funded by the European Commission, commenced on January 2006. The objective of EVICAB is to develop, build up and evaluate sustainable, dynamical solutions for virtual mobility and e-learning that, according to the Bologna process, (i) mutually support the harmonization of the European higher education programmes, (ii) improve the quality of and comparability between the programmes, and (iii) advance the post-graduate studies, qualification and certification. These actions also concern the field of biomedical engineering (BME) and medical physics (MP) and are coordinated by the Ragnar Granit Institute at Tampere University of Technology, Tampere, Finland.

The term e-curricula, as defined within the EVICAB project, refers to building up a framework of e-learning available courses, spanning the BME domain, proposed in the BIOMEDEA[3] project, available to students independent of time and location and accessible by means of computer and internet technologies, including audio-visual aids.

More project related information and the complete list of partner institutions can be found on EVICAB's official site www.evicab.eu. Questions regarding the present survey and report may be addressed to *evicab@imt.liu.se*.

About this report

This document constitutes an activity report, highlighting the policy that pervades the efforts of EVICAB members to strengthen the Bologna harmonisation process. The presented guidelines identify specific areas where e-learning needs thorough consideration in order to get the most out of its potential for e.g. student mobility and life long learning.

The target group consists of the teachers and programme coordinators, responsible for education by designing courses and/or curricula. The delimitation of the guidelines has matured and developed as a consequence of the BME survey[4] and a number of seminars and meetings in the EVICAB project. Thus, the contents of this report are adapted to the needs of the participant members although delivered in a generic manner in order to allow different implementations and to serve as a reference or starting point for any other e-learning initiative sharing the same ambitions. Iterative revisions of this document are to be expected adding, changing or clarifying the guidelines according to need and gained experiences.

The following topics are high lightened:
Course recognition
Student exchange contracts
Transparency
Student centred learning
The first two points consider practical issues of an administrative nature, while the rest consider course design and pedagogical approach. While it can be practicable with a clear demarcation of these topics for descriptive reasons it is our firm belief that these issues are interwoven in the sense that they support each other and the common cause of higher education harmonization in Europe.

Recognition (national)

Recognition of courses and degrees is a key element of the Bologna process and enables students and teachers to compare their qualifications and to include educational elements from all European universities into their own curriculum; recognition facilitates freedom of movement around a more transparent European Higher Education Area. Remarkably enough, the national reports and action plans for recognition at the Bologna 5th Ministerial Conference in London[5] displayed a rather low number of countries recognizing e-learning domestically and consequently this was shown to be even more complicated on a multilateral e-learning level. Thus, there is an imperative need for national and multilateral recognition to be manifested in joint initiatives such as EVICAB via for instance the e-curriculum laid out in this project and based on e-learning and ICT activities.

In practice every individual course can be valued on a number of different bases. The most apparent one is the expected learning outcomes, i.e. the specific intellectual and practical skills gained and assessed by the successful completion of the course. However, a course and the knowledge emanating from it are seldom to be valued in themselves; in other words, each course needs recognition in the wider context of a whole programme or of an official qualification. Ultimately, students need to have their courses/knowledge recognized in order to e.g. gain access to further new study and complete a programme or to replace a comparable course when moving to attend a programme at another institution. Academic recognition seems thus to be imperative in the promotion of academic education and student mobility. Striving for recognition should accordingly be a priority for every teacher, trying to

formalize the course existence and role in the wider context. The natural way of achieving this, is to get the course recognized at the home university, making it subject for all the rules and measures of quality that apply at the specific, accredited educational centre. This will in turn facilitate the recognition of the course by other institutions, domestic or foreign.

Guideline #1: *Every course proposed by EVICAB should encompass the recognition of its home university meaning that the gained qualifications after completion of the course are recognized and valued in a wider context.*

Action: *Follow the local regulations at the home university in order to achieve recognition for the course that is going to become promoted by the EVICAB initiative.*

Consequences: *A legal body, the home university, will own courses taking the responsibility for the courses, in order for them to follow national and international (read Bologna compliant) regulations. Moreover courses must be assigned a course code for follow up and identification and ECTS credit points recognized by the national authorities or the university educational boards, meaning that students will apply for a specific course via the international exchange office and NOT via the EVICAB platform, that can merely serve as a portal to the true course application system. The following links provide an example of how course applications are handled in Sweden in general and then more specific at Linköping University, since entrance requirements for the courses/programmes are stated in the specific course descriptions. Most certainly similar application/admission processes exist in every EVICAB member country.*

a) *https://www.studera.nu/english/studeranuinenglish.241.html*

b) *http://www.liu.se/en/*

Student exchange contracts

While free mobility and student/teacher exchange are central aspects of a common European higher education area and signed by the Bologna participants, there is still a need to validate the educational exchange with respect for the benefit of the student. Comparing with the MIT open courseware project[6], were no contracts exists, “most educational” material is free in forms of video lectures and assignments. No responsibility for examination or credit transfer is possible and practically the outcome of such an educational environment or process displays information rather than creates knowledge. Universities that do not take

responsibility for examination are merely information providers. If mutual agreement is not established, the students will not have their courses/gained knowledge accredited, neither by their home university nor by any other university, and thus a final exam cannot be accomplished. Utilizing established exchange programmes such as the ERASMUS programme is the most straight forward way to boost recognized student and teacher exchange and mobility even though on a virtual plane. The phenomenon of *free movers* is another example of successful exchange not falling within the framework of exchange programmes, but still based on thorough control and recognition procedures administered locally at every involved university.

Guideline #2: *All students interested and able to attend an proposed EVICAB course at another university should be encouraged to participate in an established educational exchange programme between the student home university and the university owing the specific course of interest. Such contracts should be established between EVICAB universities in order to facilitate the exchange but EVICAB should also foresee and encourage the creating of new contracts between educational providers. Free movers should be referred to the international relations office of their home universities in order to receive the needed help/advice of how to attend an EVICAB course.*

Action: *EVICAB members should ensure that exchange contracts exist between their home universities. If that is not the case they should act upon their universities entering such a programme or clearly state/define the process a free mover should follow. The links below describe the ERASMUS exchange programme and the advice given to students that wish to become an exchange student at Linköping University.*

http://ec.europa.eu/education/programmes/llp/erasmus/erasmus_en.html

http://www.lith.liu.se/en/stud/

Consequences: *Mutual recognition by sending and receiving institutions must be binding not only for campuses courses but also for virtual campuses. Recognized ways of application/course entrance are prepared for the students thus facilitating their intention to study "abroad" although on a virtual plane.*

Transparency

The basis for succeeding with student mobility, learning, e-learning and the EVICAB project is to create a common understanding of the outcomes represented by a qualification framework visible and transparent rather than a mere assertion of alleged comparability. This is a description similar to the proposal and expectation of the EHEA framework. In our effort to encourage students to attend courses at universities other than the home university it is important to have full insight into the other universities descriptions of their curriculum, learning outcome, prerequisites, credit points, progression etc. Transparency and openness between existing courses, curricula and 'levels' will promote a European dimension in higher education, covering traditional, integrated and joint study programmes degrees as well as the virtual campuses.

Guideline #3: *Courses or curriculum expected to be promoted by the EVICAB project should use a unified operative language in all its documents and processes, preferable English.*

Action: *All material, from course descriptions to curriculum and actions should be translated to a unified language, easily accessible and interpretable and up-to-date. Supportive and informative material facilitating the outcome should also be included.*

Consequences: *If specific curricula and courses are identified by the EVICAB project this process will mediate and establish real transparency between existing European systems of higher education since it will assist shared basis for the understanding of these systems and their qualifications. This transparency action should have a large impact on the recognition of foreign qualifications, increase the mobility of students and make outcomes more comparable.*

Guideline #4: *Curriculum and courses specified by the EVICAB project should be assigned well documented credit points according to ECTS, reflecting the learning outcomes and providing an accurate estimation of the student workload*

Action: *ECTS need to develop towards a more holistic viewpoint in order to ensure that learning outcomes in e-learning and virtual campuses are recognised appropriately in all institutions and for all types of learning. Extending the interpretation of ECTS should not, however, draw the attention away from the fundamental cornerstones of the system – learning outcomes and student workload – are well understood and implemented. Therefore,*

convince the legal bodies; universities and institutions to set aside correct ECTS credit points for all types of education

Consequences: *As a result, if courses and curricula are described through the use of ECTS as a credit transfer system and correctly used it will have an enormous impact on mobility and recognizable qualifications. An incorrect or superficial use of ECTS will hinders the re-structuring of curricula, and the development of flexible learning paths for students, while also making both mobility and recognition more difficult. Therefore institutions and legal national bodies must take responsibility for implementing a correctly use of the ECTS. The use of ECTS, its relation to student workload and the learning outcomes are important when we are rewrite and reform curriculum and recognize their learning outcomes probably more important for e-learning and the virtual campuses. Therefore, as a consequence we have to ensure that the ECTS are well understood and properly implemented so that both staff and students start to think in terms of learning outcomes both in curricula and courses.*

Guideline #5: *All courses and curricula specified by the EVICAB project should use the excepted formulation in writing learning outcomes to describe units, modules, and whole qualifications aids their transparency, recognition and student mobility.*

Action*: Implement sustainable learning outcomes at individual higher education institutions for course units, modules and programmes; on a national level for qualifications and quality assurance; and internationally to support recognition and transparency.*

Consequences: *Learning outcomes represent one of the essential building blocks for an increased transparency of the programmes for students, teachers and the labour market. In particular, for these groups of stakeholders, educational programmes would be served by the highest possible degree of clarity. Moreover, a proper description of the desired outcomes of programmes would assist in bringing structure to the learning activities of students. For the labour market, learning outcomes will offer a better insight into what knowledge and skills can be expected from graduates. Even more so, the possibility is created for employers, professional groups and individuals to respond to learning outcomes and in this way to add more substance to the dialogue needed between the business community and programmes. However, a starting point here should be: the higher education sector should be responsible for the content of the programmes.*

Student centred learning

Cannon[8] once made a statement "Student-centred learning describes ways of thinking about learning and teaching that emphasise student responsibility for such activities as planning learning, interacting with teachers and other students, researching, and assessing learning." This demands and awareness force the pace of an ongoing paradigm shift within all higher education in Europe especially true for e-learning demanding new pedagogical models. The dominating model of teacher-driven education is slowly moving towards a new and emerging student centred situation, a process highly ranked on the agenda for the Bologna process responding to a growing variety of student needs. The awareness of a new demand is increasing but the introduction is moving slowly perhaps because of poor understanding mainly of how to inherit the learning outcomes. Accordingly with the changing to a student centred learning system, students will become the engaged subjects of their own learning process, and also contribute to improving many issues of progression between cycles, institutions, sectors, the labour market and countries.

Guideline #6: *E-learning with virtual campuses as a new arena for education should take the opportunity to develop or adapt to new pedagogical models in comparison to traditional on campus educational model. The student centred model realised in a constructive alignment educational[7] model make mobility transparency and recognition cornerstones in a developing EU.*

Action: *Start to organize the learning process, on course level or programme level in such a way that: (a) the learners' interests and attitudes, coincide with the educational activities despite individual differences; (b) support and supervise training in reflecting on the learning process; (c) use authentic experience to organize learning activities; (d) make possible for all individuals to learn together and at all times and in all places a; (e) develop student learning outcomes and identify a method to assess them using well known taxonomies.*

Consequences: *Arranging like this give students more opportunities to participate in active and critical thinking in comparison with the traditional lecture paradigm. Learning maturity, student independence and learning skills and a confidence to use acquired knowledge comes with self-awareness. There is empirical evidence demonstrating that a student centred learning environment leads to deeper understanding and more satisfied learners.*

Summary

From the start of the EVICAB project there were high expectations and ambitions in becoming an ultimate portal or provider for e-learning in the field of biomedical engineering education. The intention was to continue the initiative from BIOMEDEA and create a sustainable e-curriculum accepted and recognized among all signatories of the Bologna process. A survey investigating both the attitude and existence of BME curricula was performed with a special focus on e-learning possibilities implemented as virtual campuses. If the effort of finding a common curriculum was difficult it was even more complicated to foresee or identify true e-learning BME resources. The lack of a common curriculum could be traced back to the slow adaptation of the harmonisation process of Bologna. Therefore, the absence of this common framework makes mobility and recognition of qualification almost impossible. Since the virtual campuses also are bonded to the harmonisation process most of what is going on at the campuses is also valid for the virtual campuses. Among all key elements that drive the creation of a unified European higher educational area some of them are more important than other when implementing virtual campuses. Course or curricula recognition, exchange contracts and transparency are key elements that if correctly handled will make the mobility and recognition come true both on physical and virtual campuses respectively. E-learning is not a technology driven project it is a new possibility to explore new and rich pedagogical models important in higher education. The technology will be a catalyser rather than the focus and part of the learning outcome.

References

1. Referenser, även USA-refs
2. E-learning and distance education.
3. Nagel J. (ed) Biomedical Engineering in Europe – status report. BIOMEDEA. 2005
4. Salerud E. G., Petersson H. and Ilias M. A. (eds) European Biomedical Engineering e-learning: Survey report of existing and planned BME distance courses in Europe. EVICAB, 2007
5. National reports. http://www.dfes.gov.uk/londonbologna/index.cfm?fuseaction=docs.list&DocCategoryID=17
6. Open Course Ware. http://ocw.mit.edu/OcwWeb/web/home/home/index.htm

7. Osborne M. Constructive Alignment - an Introduction. www.enhancementthemes.ac.uk/ documents/events/20040227/reviewwkshop3paperrevised.doc
8. Cannon R. Guide to support the implementation of the Learning and Teaching Plan Year 2000, ACUE, The University of Adelaide, 2000.

Postscript

Oscar Wilde's definition of a cynic was someone who knew the price of everything and the value of nothing. His epigram applies to the way we talk about education nowadays, focusing on what it can do for the economy. That is indeed important, but it does not capture the real value of education. It is almost as if people are afraid of saying education is a good thing in itself. (http://www.timesonline.co.uk/tol/news/uk/education/article2701393.ece)