

Vision for a programme of academic education in the field of standardisation for Europe – a prerequisite for the competitiveness of European enterprises and hence of Europe within the global market

(A discussion paper on the development of a contemporary teaching-study concept for standardisation as a subject of study at universities in Europe)

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Summary

The education offensive in the APEC states during the years from 2004 to 2010 in the field of standardisation saw a paradigm change occur from the educational form of in-service training by means of short seminars towards education with a sound academic basis, graded according to Bachelor or Master courses of study. In the long to medium term, this concerted educational initiative by the APEC states will result in management in industry and commerce but also government officials in ministries and certification and testing institutions obtaining a sound academic education in standardisation. According to the existing teaching curricula, this will include not only technical, economic and legal but also social teaching contents and will, consequently, provide the future managers of these countries with an expertise in standardisation that will lead to a strategic advantage for the companies and hence to a stronger level of competitiveness for the respective countries as well. The expertise in standardisation will have an effect on the positioning of the companies in global competition and provide a foundation for decisions of industrial policy in the APEC states.

In Europe, it can be stated that there are only very few higher education establishments that teach standardisation as an independent subject (optional subject). Essentially, a limited knowledge of standardisation is included in individual lectures as part of the subjects studied in courses such as mechanical engineering, electrical engineering, information technology, business administration and law.

No transfer of knowledge on standardisation under the aspects of a technological, economic, social or holistic considerations takes place at higher education establishments.

Today, the development of academic education in the field of standardisation currently occupies a historically isolated position. Since the emergence of standardisation in the 19th century, education in this subject has traditionally taken place in the form of in-service training through short seminar courses. Until the present day, essentially nothing has changed in connection with this form of training. In Europe, training in the field of standardisation is performed by the national standards bodies in further training courses for employees of industry and commerce held over a number of days. This type of training only partially conveys a knowledge of standardisation commensurate with the respective professional profile.

Academic teaching in the field of standardisation in Europe does not correspond to the status that it should have to safeguard the worldwide competitiveness of Europe. The

essential point is the lack of investment in an academic infrastructure for standardisation in Europe.

There is no doubt here that an excellent standards system has been built up in Europe; however, this will not protect our economic system if the agents in industry and commerce lack skills in the economic and strategic handling of standards.

Academic education in the field of standardisation is a prerequisite for safeguarding the competitiveness of the economy and hence of European society.

The close link between teaching and research offers the foundation for qualitatively high-value teaching in the field of standardisation, for “excellence in teaching”.

The aspiration is to achieve studies with the broadest possible support as the basis for future research and teaching but also and especially for “socially responsible behaviour”.

The aim is nothing less than the future teaching of standardisation as a subject of study, in the spirit of Humboldt’s classical vision of education.

A joint core curriculum for all students in Europe is desirable so that they will specifically learn to think in a cross-disciplinary manner, which will, for example, promote project work involving a range of different subjects.

In the Master’s course, in particular, students should become familiar with the subject of standardisation from the perspective of various disciplines. This will firstly enable interconnections with different disciplines to be imparted and secondly connections with practice outside of the university environment.

The aim is not only for students to develop into academics but for them to prepare themselves for tasks in a complex world in which it is still unclear what form the challenges of tomorrow will take.

A network should be created at European level that will allow a discussion on the further development of teaching and study in the subject at an international level as well.

Why is this important? Numerous challenges face standardisation as a subject of study. The innovation cycles of products are becoming ever shorter, the digitisation of society is advancing dynamically, climate change and environmental pollution are leading to more stringent standards for new products. Involvement with new growth markets outside of Europe is demanding new social and cultural skills from professionals; alongside technical knowledge, social skills determine who is capable of meeting professional challenges after graduation.

The aim is to develop an academically based and context-specific curriculum. This is the reason for including different curricula with different focuses for the subject of standardisation in one course, such as business administration or engineering science, etc.

The core curriculum forms the basis for this context-specific curriculum.

It must be emphasised that a sustainable development of the European standardisation system will only be secured by stable academic infrastructure for standardisation at European higher education establishments and by a merging of research and teaching.

It is our task, on the basis of the Bologna Process, to develop and implement a vision of academic education in the field of standardisation. The promotion and hence improvement of knowledge in the field of standardisation and here in particular improvement of the strategic-economic knowledge on standardisation will contribute to technical progress and to lasting economic growth in Europe.

Here we refer especially to the extensive document on the Internet, which provides detailed insight (<http://www.pro-norm.de/index.php/aktuelles-de.html?s=F7VIIcqnbvqHbOk4LZs1>)

1 University teaching and vocational training

By way of an introduction, the following are some remarks on the distinction between vocational training and a university education.

An important decision has to be made in the discussion surrounding an academic curriculum and this concerns the distinction between teaching at universities in the field of standardisation and the vocational training sector, which is currently being organised mainly by national standards bodies.

Continuing vocational training is every educational measure that supplements or extends prior vocational knowledge and training. It takes place in the form of organised learning. It is preceded by earlier phases of education and interim periods of professional employment. (see http://de.wikipedia.org/wiki/Berufliche_Weiterbildung, 16.03.2013)

Alongside prevocational training, vocational training and professional retraining, further education is a subdivision of technical and vocational education and training. ...further education is directed towards those qualifications that have already been acquired in a skilled occupation. It should be retained, extended, adapted to technical development or expanded in such a way as to enable professional progress. The qualifications acquired through further education are generally demonstrated by examinations conducted by the relevant offices (usually Chambers of Handicrafts or Chambers of Industry and Commerce). (<http://de.wikipedia.org/wiki/Fortbildung>, 16.03.2013).

1.1 Principles for study and teaching

The principles for study and teaching represent guidelines and quality objectives for the refinement of existing Bachelor and Master courses and the development of new courses. New courses to be offered at universities are designed and approved by faculties in development processes and in internal inspection processes and accredited externally.

The strategic objectives and the principles for study and teaching derived from them result from the university's mission statement which thus provides a guiding framework for the development of the university.

The Bologna Process has contributed to a sharpening of awareness for strategic concepts in which the universities redefine their objectives for study and teaching on the basis of the way they perceive themselves and their previous achievements.

Conversion to a graduated qualification system (Bachelor/Master degrees), modularisation and the view of how studies provide a professional qualification are, however, increasingly giving cause to scrutinise the quality of teaching and study. Nevertheless, it is necessary as part of the structural reform to develop a new **student-centred** culture of teaching and learning in higher education establishments at an elevated level.

Sustainability is the foundation for the development of curricular approaches to allow students to experience the link between research and teaching as the core of an academic education and open up the door to academia.

Furthermore, a number of indispensable features are able to describe a commendable teaching/study culture. These include the professionalisation of the teaching, a consideration of the heterogeneity of the students, time-related and legal freedoms for students and teachers as well as the transparency for the business of teaching and learning.

In order to raise the status of standardisation in university teaching and underline the importance for the future development of Europe as an academic location, it is essential to develop excellent teaching for the field of standardisation.

What is sought here are strategic learning concepts in which the universities recognise their objectives for study and teaching on the basis of the way they perceive themselves. It is necessary to explain how the attractiveness of the educational establishment – particularly for special courses – can be substantially increased through the subject of standardisation.

This approach promotes an improvement in teaching in the field of standardisation for the Bachelor courses, with the aim of achieving intelligently designed curricula and a good balance between the teaching of basic and specialist knowledge.

The objective is to develop and describe a core curriculum in Europe for the different faculties and subject areas/courses in order to guarantee uniform quality in teaching and, in particular, the freedom of mobility and choice for students in the subject of standardisation at different higher education establishments in Europe.

In this context, it can be assumed that there has previously been a lack of teaching culture in the field of standardisation at higher education establishments in Europe.

Furthermore, the objective should be to create incentives for new and at the same time exemplary subjects of study in the field of standardisation, which are aimed at conveying basic knowledge and an ability to see the bigger picture, in keeping with the academic specialisation offered. Work should be directed towards establishing university alliances that coordinate their curricula with each other so that students are not only able to move easily between the participating universities in Europe but are also motivated to do so.

At the same time, universities or faculties should be encouraged to form cooperation agreements in order to jointly establish the subject of standardisation or even a new course in standardisation in a certain faculty or discipline.

As the individual faculties/disciplines have different ways of working, general conditions and scope for action, the implementation of standardisation as a subject of study or course should be coordinated as closely as possible with the specific discipline. What is particularly required is interdisciplinary collaboration with a skills-centred and problem-oriented approach and, additionally, the establishment of cooperation agreements and partnerships extending beyond national boundaries.

For motivated students there is no doubt that they should be able to specifically select different locations or university chairs where they can acquire certain subject specialisations or methods. In particular, it is necessary to convey the variety of standardisation as a subject to students. If this important element of variety is neglected in education, it will jeopardise the international competitiveness of European students.

A newly established network (Internet platform) between the faculties or professors should assist and promote a change of location.

To allow the faculties to mutually recognise each other's credit points on the basis of the Bologna Process, the professors of the various universities must arrive at similar assessments for comparable teaching programmes.

A comparable teaching programme offers a core curriculum to be developed jointly, corresponding to a framework directive. This core curriculum for the subject of

standardisation should be provided with a defined intersection to all involved focuses of study. This will be facilitated by a common Internet platform via which the individual faculties/institutes/academic chairs will be able to supply information on the possible combinations in individual subjects.

Another focus of promotional effort should be international conferences, workshops and symposia to provide thematic support. The aim is to establish a discussion forum/platform for cross-border comparisons with such events and to force the pace of the debate on focal points in the subject matter in the field of standardisation within the individual disciplines in which examples of good teaching are presented, experience is exchanged and important aspects of teaching in the Bologna Process are discussed.

Different subject-related focal points could be: engineering sciences, humanities and social sciences, business administration, economics and law.

The objective should be to invite committed teachers to develop key contents in the subject of standardisation for Bachelor and Master courses. The aim is always to create an increasing number of stimulating and intelligently coordinated study units in which the students learnt to deal with their knowledge in a manner appropriate to the respective discipline.

The curricular principles of a lecture in vocational education¹ include three aspects:

- * scientific orientation
- * situational orientation
- * personality-based orientation

The curriculum:

- 1 contains the knowledge of the subject area,
- 2 is self-contained and up to date,
- 3 provides an outlook into the future development of the subject area,
- 4 is not interest-led and therefore independent,
- 5 reflects the social relevance,
- 6 is prepared didactically according to the state of the art,
- 7 is linked to the anticipated competency level of the listeners,
- 8 is directed towards the objective of developing skills.

The vision of **good teaching** also has to provide answers to the following questions:

- What objectives do we associate with the lecture?
- What learning objectives are to be achieved?
- What are the students intended to learn?
- In what ways can students acquire the knowledge independently?
- What exercises can be used to convey the teaching/study objectives?
- How can an examination be designed so that the students are motivated to continue learning?

¹ After Lothar Reetz, <http://www-user.uni-bremen.de/~sept/current/deutsch/Pdf/Material/Ma-A/Ma-A-II.pdf>

In future, it will be also be especially important to promote the independent commitment (self-learning skills) of students. This may, for example, be the setting up of a cross-border support programme in the subject of standardisation by means of peer tutoring (students advise other students/their fellow students independently)².

In conclusion it should be pointed out that communication will be the decisive tool in setting up standardisation as a taught subject at higher education establishments, i.e. repeated explanations are needed of the potential that standardisation has for strategic management within a company and the importance that standardisation has for the existence and competitive ability of Europe.

All in all, a sustainable infrastructure has to be created in Europe, which supports and strengthens all the relevant aspects of university teaching in standardisation as a subject of study.

2 Academic education

An academic education is competency-oriented and research-based. The close link between teaching and research offers the foundation for qualitatively high-value teaching, for “excellence in teaching”.

The aspiration is to achieve studies with the broadest possible support as the basis for future research and teaching but also and especially for “socially responsible behaviour”.

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A network should be created at European level that will allow a discussion on the further development of teaching and study in the subject at an international level as well.

Why is this important? Numerous challenges face standardisation as a subject of study. The innovation cycles of products are becoming ever shorter, the digitisation of society is advancing dynamically, climate change and environmental pollution are leading to more stringent standards for new products. Involvement with new growth markets outside of Europe is demanding new social and cultural skills from professionals; alongside technical

² See Elke Appel: Auswirkungen eines Peer-Education-Programms auf Multiplikatoren und Adressaten - eine Evaluationsstudie (<http://www.diss.fu-berlin.de/2002/1/index.html>).

knowledge, social skills determine who is capable of meeting professional challenges after graduation.

The important aspect is to examine the shift from classical teaching to a problem-based approach to learning based on joint research as well as the development of new competency-oriented teaching methods.

The aim is to develop an academically based and context-specific curriculum. This is the reason for including different curricula with different focuses for the subject of standardisation in one course, such as business administration or engineering science, etc. The core curriculum forms the basis for this context-specific curriculum.

2.1 Development of a curriculum in the field of standardisation

The regulatory framework should serve as a guide in the development of subjects/courses of study that cover the entire demand in certain areas. It describes the ideal model for the content design of the curricula and contains general rules for the curriculum development as well as specific proposals for new curricula. It underlines the importance of a curriculum with a balanced content that includes specialist knowledge and competencies, behavioural skills, work experience placements and project work. At the centre of attention here are university qualifications of the first and second study cycle at Bachelor/Bakkalaureus and Master/Magister level. Studies for postgraduate degrees are not considered here because of their highly specialised and research-oriented character.

The education required by graduates in the field of standardisation is not only a combination of already existing individual elements from the various subject areas. The need for a comprehensive, systematic method of consideration is of key importance as it includes the ability to understand the possibilities and limits of standardisation in the various subject areas and share a common language with all those involved.

Standardisation plays a central role in the business processes of companies. Business processes are frequently inseparably connected with one another, and the functions that they fulfil are not infrequently the basis for a company being able to carry out business transactions at all. Imparting fundamental knowledge of business administration is therefore a necessary constituent of a comprehensive education in the field of standardisation. However, this aspect appears to have received only little attention in already existing curricula.

Structure of the curricula:

Here it should be mentioned in advance that no curriculum can prepare students for employment as an expert. All curricula in the field of standardisation, however, should contain one common objective. This would enable the graduates to work in teams on joint projects and to communicate in a common language even though they have specialised in different sectors. Building on this, a more detailed qualification should be provided that is relevant for a group of largely matching requirements profiles with a shared basis of knowledge and skills. This more detailed qualification should generally satisfy the requirements of a certain generic requirements profile and cover the knowledge and competencies required for this profile.

Each curriculum should consist of modules following on from each other, as follows:

- (a) core modules,
- (b) subject-specific core modules and

(c) optional modules.

Specialist knowledge:

(a) The core modules convey the academic and technological foundation that forms the basis of all qualification profiles. They also contain the comparatively constant knowledge. Students are recommended to study a selection of these modules during their first year of study.

(b) The subject-specific core modules convey the technological and engineering foundation which is characteristic of the technological section of the respective group of core requirements profiles. They also contain the knowledge that is subject to rapid changes. It is suggested that these modules should be taken as from the second year of study.

(c) The optional modules convey the rapidly changing knowledge that becomes outdated within a period of three to five years. They encompass new technological and engineering knowledge. These modules are aimed at the subject-specific specialisation and are intended to balance out the differences in the core modules. They thus enable greater flexibility and specialisation in certain areas.

This structure can be applied to both curricula for the first cycle of study and to curricula for the second cycle of study, although it should be borne in mind that all modules of the second cycle of study should be at an advanced level.

3 Structural principles of Bachelor and Master courses

The common structural guidelines of the German länder for the accreditation of Bachelor and Master courses of study in Germany were passed in 2003³.

These guidelines also represent an important step on the way to setting up the European Higher Education Area within the scope of the Bologna Process. In this context, there is a constant discussion on the “breadth” of the teaching contents in the first semesters, with the tendency now being to offer more general education and less specialisation with a view towards the requirements of life-long learning.

3.1 Consecutive subject or course of study.

Good teaching is distinguished by the sequence and structure of the course unit following a thematic logic. The sequence of the lectures is characterised by a content structure that matches the defined teaching/study objective. Consequently, course units that build up on each other can only be attended consecutively. The foundation of a course unit is a lecture course that refers to a manuscript or a bibliography.

The contents imparted in **Bachelor courses** are academic principles, methodological competence and professionally relevant qualifications in keeping with the profile of the higher education establishment and the course of study. This ensures a broad level of academic qualification in Bachelor courses. Proof of 180 ECTS credits has to be provided for the Bachelor qualification. The scope of the work for the Bachelor thesis is at least 6 ECTS credits and must not exceed 12 ECTS credits.

³ Resolution of the Conference of German Cultural Ministers from 10 October 2003 in the version dating from 4 February 2010, Germany

Master courses are intended for subject-specific and academic specialisation and can be distinguished as having either an application-oriented or a research-oriented profile type. Generally 60 ECTS credits are awarded per year of study, i.e. 30 per semester.

A total of 300 ECTS credits – including those from the preceding qualification – are required for the Master’s qualification. The scope of the work for the Master thesis attracts 15 – 30 ECTS credits.

During the development of curricula in the field of standardisation a clear distinction has to be made between the specialist contents for the Bachelor and Master courses.

4 The academic subject of standardisation as part of the digital world: A model on the Internet

The lecture based on PowerPoint presentations held face to face in a lecture theatre or seminar room is still the dominant form of teaching at German universities. There is often no assurance that the contents of the lecture are topical.

Breaking up these structures is a prerequisite for a future-oriented and sustainable teaching/study concept in the field of standardisation. At the same time, sustainability is a guiding philosophy for future viability and hence competitive ability.

The aim should be to create a freely accessible Internet platform in the form of a “standardisation MOOC (sMOOC)”⁴ for academic teaching Europe in order to develop comparable forms of teaching and learning in the subject of standardisation in the future. At the same time, we would be contributing to the democratisation of education in the field of standardisation and confronting the knowledge dominance of the standardisation organisations. A competition “standards for good teaching” should also be organised to encourage professors and lecturers by providing them with funding and sufficient time for teaching.

A European Internet network in teaching will include many nationalities with different teaching and learning cultures, both on the part of the students and the teachers. The technical facilities of a modern Internet platform offer students and teachers a way to cooperate and at the same time gain insight into their teaching/learning problems which they will be able to systematically solve together in the future. This will also enable them to respect, recognise and bridge their cultural differences.

Via an Internet platform, students receive teaching contents, videos, PDF materials, workshop offers and the like placed on their virtual desktop. This will characterise the learning processes in the near future. In a first step, this Internet platform will play a key role by allowing the familiar social tools, blogs and wikis to be used. On the other hand, learner-centred education means that more reliance is placed on teamworking ability through students independently setting up study groups via the Internet platform.

Digitisation of the teaching contents, modern teaching/learning concepts, e-teaching/learning management systems, particularly the Internet, are for the first time supplying the conditions for networked teaching in Europe and in a global world.

⁴ The term massive open online course (MOOC) denotes a special form of open access online courses with a large number of participants and generally free of charge.

EURAS⁵ as an alliance of academic expertise on standardisation in Europe offers the precondition for creating an infrastructure for academic teaching in Europe. Academic excellence is part of the tradition of excellent teaching; incorporated into a digital teaching/learning concept within the Internet, it is a precondition for developing dynamism and distribution and hence a success strategy for conveying knowledge in the field of standardisation. This new form of conveying knowledge represents a simple and free-of-charge access to the standardisation courses. As a result, a democratisation of teaching independent of dominant institutions will be achieved in the future, and the **authority of definition** in the subject of standardisation will be safeguarded in the spirit of freedom of research and teaching.

The aim is to develop online courses for standardisation that meet the quality requirements of a Bachelor and Master course of study at higher education establishments.

In order to guarantee the quality of teaching, it is recommended that cooperation agreements should be made between the higher education establishments in Europe which define a canon of elements for “good teaching” (Bologna Process, module description). The basis for this agreement should be the joint use of an Internet platform. An initial module description is presented, with the Internet platforms that feature MOOCs serving as an example.

5 Founding of a skills pool and deductions

The founding of a skills pool acts as a means of promoting the teaching of standardisation in Europe. The task of the skills pool will also be to form and support groups of experts for the various subject areas in higher education teaching (see Korea).

It represents a way of combining existing and yet-to-be-gathered knowledge and experience to improve the quality of teaching in the field of standardisation. The duties of higher education teachers in the skills pool include the planning of skills-oriented curricula or the organising of balanced examination methods.

The members of the skills pool have the objective of working together in a quality circle, oriented towards the guidelines of the Bologna Process. The main task in the next two years is to draw up a “regulatory framework”⁶. This involves specifying institutional principles and “prerequisites for good teaching”. The regulatory framework to be drawn up in the skills pool is also used for the cross-border evaluation of lecture courses. The framework regulation should be published after its completion.

At the same time the regulatory framework should be the basis for being able to better assess or compare teaching performances by higher education establishments in the

⁵ EURAS, the European Academy for Standardisation e.V., was founded in Hamburg in 1993 by researchers from various academic fields (i.e. economics, engineering, social sciences, law, and information sciences). It is a registered society under German civil law, and a non-profit organization. The foundation of EURAS was prompted by a common desire to promote and achieve progress in the academic treatment of standardisation, involving the widest possible range of disciplines. The society's activities focus on: promoting standardization research, a critical evaluation thereof in the interest of scientific education, improving opportunities to publish research results, and supporting the development and professionalization of standards education(www.euras.org)

⁶ The regulatory framework contains features such as a structure of core units which, as part of sample examination regulations, provide students with a guarantee of validity at the individual higher education establishments in Europe. (The framework includes sample examination regulations for test which individual higher education institutions...)

subject of standardisation. Until now there has been a lack of consensual criteria for this purpose.

Furthermore, it is also necessary to form groups of six to twelve teachers in higher education who undertake to work together as a “professional teaching/learning community” on a topic of their own choice for one year. This might involve the designing of new teaching modules or complete curricula, the designing of teaching exercises or the development of activating working methods for students.

Generally it is taboo for teachers to attend a colleague’s lecture. The higher education teachers in the skills pool will agree to open their lectures and allow other colleagues to attend or invite them to an exchange of experience. This will lead to synergies resulting in better teaching methods.

Sitting in on a colleague’s lectures is a successful method of activating the potential for good teaching. The intensive exchange is intended to develop trust among the teaching staff.

Sustainable and dynamic development of quality in teaching also requires reliable outside funding along the lines of the model of research funding through the German Research Association (DFG). This concerns financial support for innovative targets in teaching such as the inclusion of digital media and the Internet. A crucial aspect here is not only the material support; equally important is the consideration that outside funding for teaching is an important reputational factor within the academic scientific system.

5.1 Arguments for reaching a consensus

It is crucial to bring about a consensus on an academic infrastructure for standardisation in Europe. This comprises decisions on

- the financing and structure of independent academic chairs/professorships for the subject of standardisation.
- a skills pool for promoting teaching, made of up teachers in higher education, representatives of industry and commerce, representatives of NSBs, representatives of state institutions (e.g. PTB, BAM, etc.)
- the development of curricula for teaching the subject of standardisation for various Bachelor and Master courses with an agreement on core contents (core units).
- the provision of and access to digitally processed teaching materials
- a fundamental didactic concept including digital media for teaching (guideline for lecture manuscript, exercises, multiple-choice tests, FAQs and forms of support, etc.)
- fundamental examination requirements in the various subject areas (courses) at higher education establishments in Europe.
- an agreement on mutual, cross-border recognition of student examination achievements in Europe.
- an agreement on the exchange of higher education teachers as well as mutual observation by teaching staff in the subject of standardisation at higher education establishments in Europe.
- a system of tutorial support with a European design for students in the subject of standardisation based on the NEW MEDIA (Internet platform, chat, forums, blogs, wikis, e-mail), with the organisation and responsibility in the hands of teachers in higher education together with representatives of industry and commerce as well as the NSBs.

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