work. As a result, the course materials are not mechanically learnt, but comprehend by students. This fact is proved by students' learning achievements and interim evaluation results.

It is worth noting that there is a great variety of interactive teaching technologies. The educational games described in the current article are just the example of how educators can improve the educational process by introducing modern interactive forms of teaching. Thus, interactive teaching technologies have a great potential to form the competences of future professionals.

REFERENCES

1. Panfilova, A.P. Innovative teaching technologies. Active teaching: textbook / A.P. Panfilova. – M: Academia, 2009. – 192 p.
2. Panina, T.S. Basic ways to make teaching interactive: textbook / T.S. Panina, L.N. Vavilova; edited by T.S. Panina. – 4th edition. – M: Academia, 2008. – 176 p.

UDC 378

On-line Quality Assurance of Study Programmes: EQUASP Approach

University of Genoa, Polytechnic School
Alfredo Squarzoni
Universitat Politecnica de Catalunya
Juan J. Perez
Peter the Great St. Petersburg Polytechnic University
Vladimir E. Mager

The description of the EQUASP model for quality assurance of study programmes, developed in framework of a TEMPUS project, is introduced.
The introduction section contains brief information on the concept of quality and quality assurance of study programmes along with the Tuning approach to the design of study programmes and the standards and guidelines for quality assurance in the European Higher Education Area.
The fourth section describes the EQUASP approach to quality assurance and pinpoints the necessary documentation for the quality assurance of study programmes. More specifically, the EQUASP standards for the quality assurance of study programmes are defined, followed with the identification of the fundamental processes for a quality management of study programmes together with the associated quality requirements and expected activities for their accomplishment.
The information and data which study programmes need to document in order to provide evidence of the quality of the educational service offered and therefore, to assure their quality, are established.
The standards and guidelines constitute the 'EQUASP Model' for the quality assurance of study programmes.
The fifth section introduces the EQUASP approach for monitoring of quality of study programmes perceived by interested parties (students, graduates, employed graduates and employers).
Finally, the sixth section summarizes the objectives already achieved and introduces the activities in progress for the completion of the project according to the established work plan, while the conclusions summarize the benefits of the EQUASP system.

Key words: study programmes, quality assurance, tuning approach, documentation of quality of study programmes, monitoring study programmes' quality.

Introduction

Quality of study programmes (SPs) can be evaluated by the level of fulfilment of the educational objectives or, in other words, the level of accomplishment of the quality requirements established coherently with the needs and expectations of all those who are interested in the educational service provided, i.e. the 'interested parties' (IPs).

In order to achieve the required level of quality as well as to identify areas for improvement, responsible units of the SPs normally use a quality assurance (QA) system as instrument. A QA system aims at accomplishing the desired requirements and expectations of all the IPs, including the identification and measurement of the level of accomplishment of stated requirements of SPs, as well as to ensure

A. Squarzoni

J.J. Perez

V.E. Mager

a feedback from the different IPs on the perceived satisfaction with the results of SPs execution. Furthermore, these results must be available to the public, so that QA is a tool to make SPs quality transparent and trustworthy for all the IPs. In other words, QA of a SP can be defined as the whole of activities (processes) for the management of the educational service aimed at achieving the established educational objectives and then at 'ensuring trust' in meeting the quality requirements to all the IPs.

An essential and necessary aspect of QA system of SPs involves a clear and complete documentation of learning objectives, educational process, learning context, programme results and management system. This is a requirement established by the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) [1], in which, in 'Part 1: Standards and guidelines for internal quality assurance - 1.8 Public information', is prescribed that "Institutions should publish information about their activities, including programmes, which is clear, accurate, objective, up-to-date and readily accessible".

The availability of information and data on the characteristics and expected results of SPs is essential for their transparency, one of the most important objective of the Bologna process, and in order to 'ensure trust' in the SP capacity to meet the requirements for quality. In other words, it is essential to assure SP quality, making possible the formulation of an informed judgment on the SPs quality by all the IPs, students and employers above all. The availability of information and data about the characteristics and results of SPs is also essential for their comparability at national and international level, which is another important objective of the Bologna process. On the other hand, the availability of information and data on the characteristics and expected results of SPs constitutes a powerful incentive to the improvement of SP quality (as a matter of fact, when a SP is required to document its quality, in case of bad quality it is also stimulated to adopt the opportune actions for its improvement). Finally, easy access to the information and data is necessary in every quality assessment and accreditation process.

Another key aspect of a QA system is IPs feedback on the quality perceived of a SP. This is a necessary and essential element for the assessment of SPs quality and for the monitoring of the SPs quality perceived by IPs becomes obligatory and of outmost importance in a QA system.

Tuning Approach to the Design of Study Programmes

The Bologna process, with the introduction of a three-cycle system, has produced a drastic change in the design of SPs. In a cycle system, each cycle should be seen as an entity in itself. In particular, the first two cycles should not give access only to the following cycle, but also to the labour market.

At present Higher Education Institutions (HEIs) are undergoing a 'student-oriented/ centred' approach, which takes the student as the centre of the teaching and learning process.

The methodology for design educational programmes consistent with the Bologna process principles has been developed within the framework of the Tuning Educational Structures in Europe [2].

The quintessence of the Tuning approach [3] resides in the so called 'degree profile'. The degree profile must clearly define the aims and purposes of the SP, describe in terms of competences and learning outcomes what graduates will know, understand and be able to do by the time they have successfully completed the SP, spell out what can be expected of the graduates in terms of the kinds of tasks they are equipped to undertake, their level of expertise and the responsibilities they can assume.

Standards and Guidelines for Quality Assurance in the European Higher Education Area

Today the definition of suitable academic strategies in order to promote SP quality can rely on the standards and guidelines for quality assurance of higher education (HE) established in the ESG adopted by the Ministers of HE of 45 countries in the meeting in Bergen (Norway) on 19-20 May 2005 and revised in the meeting in Yerevan (Armenia) on 14-15 May 2015. They have found a generalised acceptance in the European context.

In the ESG, the term 'quality assurance' is used to describe all activities within the continuous improvement cycle (i.e. assurance and enhancement activities). The 'standards' set out agreed and accepted practice for QA in higher education in the EHEA and should, therefore, be taken account of and adhered to by those concerned, in all types of higher education provision.

The 'guidelines' explain why the standard is important and describe how standards might be implemented. They set out good practice in the relevant area for consideration by the actors involved in QA. Implementation will vary depending on different contexts.

It is important to note that the purpose of these standards and guidelines is to provide a source of assistance and guidance to HEIs in developing their own QA system, as well as to contribute to a common frame of reference, which can be used by institutions. It is not the intention that these standards and guidelines should dictate practice or be interpreted as prescriptive or unchangeable.

The standards are in three parts covering internal QA (Part 1), external QA (Part 2) and QA by agencies (Part 3). The standards for QA agencies regard the characteristics that should be fulfilled by QA agencies.

Implementation of QA models for SPs have been developed in the past. In the present we describe our contribution to the EQUASP Model developed in the framework of the EQUASP[1] project which general objectives of are:

- The promotion of the improvement of the quality of technological SPs through the implementation of a QA procedure, focused on the definition of learning outcomes, according to the Tuning approach to the design of SPs, and consistent with the revised ESG.
- The design and implementation of an on-line documentation of the QA of SPs and of an on-line monitoring of their quality perceived by IPs.
- Dissemination of EQUASP approach and the results achieved along with awareness on ESG among partner universities.

The following sections describe the design of EQUASP approach and standards, which could help to introduce and implement on-line QA of SPs.

EQUASP Standards and Guidelines for the Quality Assurance of Study Programmes (EQUASP Model)

Consistently with the Tuning approach to SP design, the ESG and with the models for the quality assessment and accreditation of SPs adopted by the European agencies, in particular, with the EUR-ACE Framework Standards and Guidelines [4], the EQUASP approach to QA of SPs assumes that in order to assure its quality a SP must comply with the national standards and requirements, as well as:

- Establish educational objectives consistent with the mission of the institution the SP belongs to and the educational needs of the labour market of reference, and learning outcomes consistent with the educational objectives.
- Design and implement an educational process adequate to achieve the learning outcomes, which embeds a student-centred learning approach, ensure a correct assessment of students' learning, keep under control its development and establish

[1] EQUASP is a Tempus project No. 543727-TEMPUS-1-2013-1-IT-TEMPUS-SMGR

appropriate regulations for students' admission, recognition, progression and attestation.
- Have teaching staff, facilities, student support services, partnerships with businesses, research institutions and other HEIs, and financial resources adequate to achieve the learning outcomes and keep them under control.
- Monitor the results of the educational process;
- Adopt an adequate and effective management system able to assure the SP quality and its continual improvement, and guarantee public access to the information on the SP.

These principles should inspire the design, development and control of every SP. Correspondingly, the EQUASP approach defines the five 'EQUASP standards' for the QA of SPs:
- Standard A – Needs and Objectives.
- Standard B – Educational Process.
- Standard C – Resources.
- Standard D – Monitoring and Results.
- Standard E – Management System.

The processes associated to each EQUASP standard to be considered fundamental for a management for quality of SPs have been identified again consistently with the Tuning approach to SP design, the ESG and the models for the quality assessment and accreditation of SPs adopted by the European agencies. They are listed in Table 1.

Then the 'EQUASP requirements for quality', i.e. needs or expectations for quality, associated to each identified process have been established according to the ESG, with the activities to be managed for their accomplishment. Furthermore, for each identified quality requirement the information and data to be documented by the SPs in order to provide evidence of the quality of the educational service offered, and therefore to assure their quality, have been established, again according to the ESG.

EQUASP standards, the EQUASP requirements for quality associated to each standard and each process, the information and data to be documented associated to each of quality requirements are reported in Table 2.

The complete set of standards for QA, quality requirements with the associated expected activities for their accomplishment, and documentation for QA with a description of the information and data to be documented constitute the EQUASP Standards and Guidelines for the internal quality assurance of study programmes in partner countries (EQUASP Model) [5].

It is important to note that the EQUASP Model assumes that the SP is the only structure in charge of the management of the processes associated to the quality requirements. In some cases, the structures in charge might be others, in particular the structure the SP belongs to. This does not imply any change as for both the quality requirements and the expected activities for their fulfilment.

EQUASP Questionnaires for the Monitoring of the Perceived Quality of Study Programmes

The EQUASP Questionnaires for the monitoring of the perceived quality of study programmes [6] propose a minimum number of questions for the collection of the opinions of the IPs that should be common to all SPs. IPs considered in the present model include students, graduates, employed graduates and employers.

The monitoring of the students' opinions regards the course units and include the following sections:
- organization of the course unit (in particular, lecture timetable, required workload, availability of educational material);
- teaching activity;
- facilities used by the course unit (in particular, classrooms and laboratories);
- interest and usefulness of the course unit.

The monitoring regards also the

Table 1. Fundamental processes for management of quality of SPs according to EQUASP approach

Standard	Fundamental processes
A Needs and Objectives	A1 – Identification of the educational needs of the labour market and other stakeholders A2 – Definition of the educational objectives A3 – Definition of the learning outcomes
B Educational Process	B1 – Design and planning of the educational process B2 – Admission, recognition, progression and attestation B3 – Realization of the educational process
C Resources	C1 – Identification and assignment of the teaching staff C2 – Identification and allocation of facilities (in particular: lecture and study rooms, laboratories, libraries) and support staff C3 – Organisation and management of student support (orienteering, tutoring and assistance) services C4 – Establishment of partnerships with national and international businesses, research institutions and other Higher Education Institutions for carrying out students' external education and mobility C5 – Identification of the needs and allocation of financial resources
D Monitoring and Results	D1 – Monitoring of the incoming students D2 – Monitoring of the students' learning D3 – Monitoring of the students' progression in their studies D4 – Monitoring of the students' opinion on the educational process D5 – Monitoring of the graduates' placement D6 – Monitoring of the employed graduates' and employers' opinion on the graduates' education
E Management System	E1 – Definition of the policy and organization for quality assurance of study programmes E2 – Definition of the management system of the study programme E3 – Review E4 – Provision of public access to information on the study programme

students opinions on the effectiveness of training periods outside the University and international mobility.

The monitoring of the graduates' opinions regards:
- the overall organization of the SP;
- the whole of the facilities used by the SP (in particular, libraries);
- the student support services (orienteering, tutoring, assistance);
- the effectiveness of the educational process.

The monitoring of the employed graduates' opinions regards their perception of strengths and weaknesses of their education compared to their working experience, while the monitoring of the employers' opinions regard their perception of strengths and weaknesses of the education received by employed graduates.

For each question, the EQUASP questionnaires propose a set of possible answers, based on four fundamental answers (Yes / More yes than no /More no than yes / No or Positive / More positive than negative / More negative than positive /Negative), among which

students, graduates, employed graduates and employers shall have to choose their own answer. Of course, each university/SP can add other questions of its specific/particular interest.

Further developments within the EQUASP project

Definition of the EQUASP Model and Questionnaires have been the main outcomes of the first year and a half of activity of the project mentioned above. The second part of the project will be devoted to the design, production and implementation by a meaningful number of SPs of the partner Universities of the EQUASP Software for the on-line documentation of the QA of SPs and of the EQUASP Software for the on-line monitoring of the SPs' quality perceived by IPs.

The EQUASP Software for the on-line documentation will be resident in the site of the project partner CINECA and will be kept operative for at least two years after the end of the project for all partner Universities. The EQUASP Software for the on-line monitoring will be installed in each partner University. Both will be available for free to any Higher Education Institution of Russian Federation.

Conclusion

The EQUASP Model and Software (EQUASP System) introduced, it should be considered as a powerful tool which allows to:

1. promote the design of student-centred SPs, focused on the definition of learning outcomes consistent with the needs of the IPs;

Table 2. Standards, Requirements for Quality and Documentation for QA of SPs according to EQUASP approach

Standard	Quality Requirements	Documentation
Standard A **Needs and Objectives** The study programme should identify the educational needs of the labour market of reference and other stakeholders, establish educational objectives coherent with the mission of the institution the study programme belongs to and the identified educational needs, and learning outcomes coherent with the established educational objectives	**A1 – Educational needs of the labour market and other stakeholders** The study programme should identify the educational needs of the labour market of reference and other stakeholders. The educational needs should be identified in terms of professional profiles and/or functions/roles/activities expected for the graduates and associated required competences	■ Organisations/employers consulted and Methods and schedule of consultation ■ Identified educational needs of the labour market ■ Identified educational needs of other stakeholder
	A2 – Educational objectives The study programme should define educational objectives in terms of professional profiles of the graduates and/or functions/roles/activities students are to be prepared for and associated key competences to be developed and obtained by the students during the learning process, consistent with the mission of the institution the study programme belongs to and the identified educational needs	■ Educational objectives
	A3 – Learning outcomes The study programme should define learning outcomes, in terms of what students are expected to know, understand and/or be able to demonstrate after completion of the educational process, consistent with the national qualification framework, if any, and the established educational objectives	■ Learning outcomes ■ Comparison with learning outcomes of other SPs of the same typology

ENGINEERING EDUCATION
18'2015

Standard	Quality Requirements	Documentation
Standard B **Educational Process** The study programme should assure students educational activities able to achieve the established learning outcomes through contents, methods, workload and times adequately designed and planned, promote a student-centred teaching and learning approach, assure a correct assessment of students' learning through suitable assessment methods and criteria. The study programme should also define appropriate rules covering student admission, recognition, progression and attestation and keep under control the development of the educational process	**B1 – Design and planning of the educational process** The study programme should design a curriculum and characteristics of the course units and of the graduation exam consistent with the established learning outcomes. The curriculum should embed a student-centred learning and teaching approach. The study programme should also define assessment methods and criteria able to ensure a correct assessment of the students' learning. Furthermore, the study programme should plan the development of the educational process in order to enable students to achieve the learning outcomes in the expected time, according to a gradual process and through coherent and coordinated educational activities	■ Curriculum ■ Characteristics of the course units ■ Characteristics of the graduation exam ■ Suitability of the curriculum to the achievement of the learning outcomes ■ Calendar and timetable of course units and exams
	B2 – Admission, recognition, progression and attestation The study programme should establish rules covering all phases of the student 'life cycle', and in particular student admission, recognition, progression and attestation	■ Admission ■ Recognition ■ Progression ■ Attestation
	B3 – Realization of the educational process The study programme should realise the educational process coherently with the designed and planned development and keep under control its development, in order to resolve any urgent and immediate problem and to check the adequacy of the assessment tests and of the final work/thesis to the learning outcomes and the correctness of the evaluation of the students' learning	■ Control of the development of the educational process ■ Control of the assessment tests and of the final work/thesis
Standard C **Resources** The study programme should have at disposal teaching staff, facilities, student support services, partnerships	**C1 – Teaching staff** The study programme should have at disposal teaching staff, including teaching support staff, quantitatively and qualitatively adequate for the achievement of the established learning outcomes by students. The teaching staff should be assigned according to pre-definite criteria of choice or selection and the programme should offer the teaching staff the opportunity to improve their teaching skills and the use of new technologies	■ Teaching staff ■ Teaching support staff
	C2 – Facilities and support staff The study programme should have at disposal facilities (lecture and study rooms, laboratories, libraries), with the associated equipment, and technical-administrative staff quantitatively and qualitatively adequate for the development of the established educational activities as designed and planned and able to allow the application of the established educational methods	■ Lecture rooms ■ Study rooms ■ Laboratories ■ Libraries ■ Other resources and special initiatives

Standard	Quality Requirements	Documentation
and financial resources adequate for the achievement of the learning outcomes and able to make easier the students' progression in their studies	**C3 – Student support services** The study programme should have at disposal student support (orienteering, tutoring and assistance) services relevant to the educational process and able to make easier students' learning and progression in their studies	■ Student administrative office ■ Orienteering service for incoming students ■ Tutoring service ■ Service for carrying out training periods outside the University ■ Mobility service ■ Job placement service
	C4 – Partnerships The study programme should have partnerships with national and/or international businesses, research institutions and other Higher Education Institutions quantitatively and qualitatively adequate for carrying out students' external education and mobility	■ Partnerships for carrying out training periods outside the University ■ Partnerships for carrying out mobility periods
	C5 – Financial resources The study programme should have at disposal financial resources adequate for the development of the educational process according to the designed and planned activities	■ Needs of financial resources ■ Availability of financial resources
Standard D **Monitoring and Results** The study programme should monitor the results of the educational process, at least with respect to incoming students, students' learning, students' progression in their studies and graduates' placement, the students' opinion on the educational process	**D1 – Incoming students** The study programme should monitor the incoming students in order to check its attractiveness	■ Assessment of the possession of the admission requirements *(only first cycle and integrated second cycle SPs)* ■ Enrolments at the first course year
	D2 – Students' learning The study programme should monitor the students' learning in order to check the effectiveness of the course units	■ Students' learning ■ Further monitoring
	D3 – Students' progression in their studies The study programme should monitor the students' progression in their studies (in particular: dropouts, number of credits acquired at the end of each course year, time to graduation) in order to check the effectiveness of the educational process	■ Enrolments at the different course years ■ Dropouts ■ Credits acquired by the students ■ Graduation time
	D4 – Students' opinion on the educational process The study programme should monitor the students' opinion on the educational process in order to check the perceived adequacy and effectiveness	■ Students' opinion on the course units ■ Students' opinion on the training periods outside the University ■ Students' opinion on the periods of mobility ■ Opinion of the final year students on educational process and support services

Standard	Quality Requirements	Documentation
and the employed graduates' and employers' opinion on the graduates' education, in order to check the adequacy and effectiveness of the educational service provided	**D5 – Graduates' placement** The study programme should monitor the graduates' placement in order to check the demand of the granted qualification and the correspondence of the educational objectives and learning outcomes of the study programme to the educational needs of the labour market	■ Graduates' job placement ■ Prosecution of the studies in the second cycle programmes *(only for first cycle graduates)* ■ Prosecution of the studies in PhD programmes *(only for second cycle graduates)*
	D6 – Employed graduates' and employers' opinion on the graduates' education The study programme should monitor the employed graduates' and employers' opinion on the graduates' education in order to check the correspondence of the educational objectives and learning outcomes of the study programme to the educational needs of the labour market	■ Employed graduates' opinion on the education received ■ Employers' opinion on the graduates' education
Standard E **Management System for Quality** The institution the study programme belongs to should have a public quality assurance policy and an effective organization for the quality assurance of study programmes. The policy should be put into practice by the study programme through the definition and adoption of an appropriate and effective management system, able to assure the quality of the study programme and the continual improvement of the effectiveness of the processes for the study programme management and of the associated results	**E1 – Policy and organization for quality assurance of study programmes** The institution the study programmes belongs to should have a public policy and an effective organization for the quality assurance of study programmes, and effective decision-making processes	■ Policy for quality assurance ■ Organization for quality assurance
	E2 – Management system of the study programme The study programme should implement an appropriate and effective management system, through the identification of the quality assurance processes and the definition of a relevant organisational structure	■ Management system of the study programme
	E3 – Review The study programme should periodically review needs and objectives, educational process, resources, results and management system, in order to guarantee their constant adequacy and effectiveness and promote the improvement of the effectiveness of the processes for the study programme management and of the associated results. Students and representatives of the labour market of reference should be involved in the review process	■ Management of the review process ■ Results of the review process
	E4 – Publicly availability of information The study programme should make publicly available full, up to date, easily acquired information, both quantitative and qualitative, on study programme objectives, educational process, resources, results and management system	■ Publicity of the documentation for the QA of the SP

2. bringing the QA process of SPs in accordance with the ESG;
3. enhance quality of SPs and increase their transparency and comparability, in order to enhance trust in the quality of SPs and make possible to formulate an informed judgment on the educational process offered by SPs;
4. promote modernisation of higher education through an on-line documentation of the characteristics and results of SPs.

REFERENCES

1. Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) [Electronic resource]. – Brussels, Belgium, 2015. – 32 p. – URL: http://www.enqa.eu/wp-content/uploads/2015/11/ESG_2015.pdf, free. – Tit. from the screen (usage date: 04.12.2015).
2. TUNING Educational Structures in Europe [Electronic resource]: [site]. – [Spain, 2004–2015]. – URL: http://www.unideusto.org/tuningeu, free. – Tit. from the screen (usage date: 04.12.2015).
3. Universities' contribution to the Bologna Process. An introduction [Electronic resource] / ed. by J. Gonzalez and R. Wagenaar. – 2nd ed. – Bilbao, 2008. – 164 p. – URL: http://www.unideusto.org/tuningeu/images/stories/Publications/ENGLISH_BROCHURE_FOR_WEBSITE.pdf, free. – Tit. from the screen (usage date: 04.12.2015).
4. EUR-ACE® Framework Standards and Guidelines [Electronic resource] // Europ. Network for Accreditation of Eng. Education (ENAEE): site. – [S. l.], cop. 2012. – URL: http://www.enaee.eu/publications/european-framework-standards, free. – Tit. from the screen (usage date: 04.12.2015).
5. EQUASP Standards and Guidelines for the internal quality assurance of study programmes [Electronic resource]. Rev. 6: Approved by the Project Board in the 4th meeting in Moscow on 11 March 2015. – [S. l.], 2015. – 29 p. – URL: http://equasp.tstu.ru/public/reserved_area/EQUASP%20S&G%20Rev%206.pdffree. – Tit. from the screen (usage date: 04.12.2015).
6. The EQUASP Questionnaires for the monitoring of the perceived quality of study programmes [Electronic resource]. Rev. 4: Approved by the Project Board in the 4th meeting in Moscow on 11 March 2015. – [S. l.], 2015. – 13 p. – URL: http://equasp.tstu.ru/public/reserved_area/EQUASP%20Questionnaires%20Rev%204.pdf, free. – Tit. from the screen (usage date: 04.12.2015).

UDC 378.126

On Modelling Management Process in Engineering Schools

South Ural State University,
Financial University under the Government of the Russian Federation
Ju.V. Podpovetnaya
Financial University under the Government of the Russian Federation
N.A. Kalmakova

The article considers an education process in an engineering school. Economic and mathematical approaches to education management modeling are suggested to build a new architecture of education process. The authors describe the application of Production Function Model to education process in a technical university. Special attention is paid to research management model and quality model for graduate training.

Key words: engineering university, educational process, the quality of education, simulation.

Education institution is an open system of interacting and controlled constituents (divisions, staff, etc.) with a particular strategy, mission, and limited resources. It is necessary to design structural and functional models to develop theoretical and applied aspects of management as well as to choose methods to forecast education processes in engineering schools.

While developing management models for basic processes in a higher education institution, the use of economic and mathematical methods has recently become an integral part of high technology. It is caused by the fact that most of Russian higher education institutions face such problems as weak marketing strategy, poor ad-justability of university organization structure to market conditions etc. These circumstances allow using the production function model for education processes of an engineering school [1; 2 et al.].

The analysis shows that basic products of higher education system are graduates (of different degrees and specialties) and scientific research (articles, monographs, dissertations, patents etc.). Production factors include staff (academic and non-academic), facilities (structures and constructions), and people entering the University. It can be expressed by the production function of the following form:

$$R = f\ (G, S, E, D) \qquad (1)$$

where R – product of education activity; G – number of graduates; S – staff; E – equipment; D – number of people entering the University.

To consider equation (1) as the production function, it should satisfy the efficiency feature, which means that at specified values of arguments, R should be on the curve of production capacity and reach the maximum in regards to other variables. Taking into account that there is a department aggregation in equation (1), the formula assumes that the resources are effectively distributed among the departments. It is obvious that this assumption is impossible in some cases. Thus, it is necessary to indicate a particular department with index i, which allows expressing the function for a University as follows:

$$R = \sum R_i = \sum f_i\ (G_i, S_i, E_i, D_i) \qquad (2)$$

To state the objectives of higher education is an important starting point of the analysis. It is natural to assume that the

Ju.V. Podpovetnaya

N.A. Kalmakova