The Competence Model for Experts of Accreditation Center of Association for Engineering Education of Russia

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Indicators and characteristics of AC AEER experts' competencies are considered in the article

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«Scientists investigate that which already is;
Engineers create that which has never been.»
Albert Einstein

Globalization and internationalization as the major trends in society development have increased the requirements for recognition and acknowledgement of content and outcomes of higher engineering education of all countries involved in the integration process.

It has become apparent that a purely external integration, achieved by previously signed conventions, is not sufficient to make dramatic improvements in education quality. Not only results recognition (diploma, degree, qualification) is needed but also trust (credo) to the process (training, practice, internship, design). It is important to influence and interfere in the internal processes of universities - the main teaching triad of teaching "what is taught, how is taught and by whom is taught" [1]. One of the ways for multilateral assessment of university activities aimed at improving quality of education is public and professional accreditation of educational programs. Association for Engineering Education of Russia was among the first organizations which have carried out a professional survey of this problem. [2]. AEER structural unit - Accreditation Centre - provides primary assessment of educational programs and university self-study materials, organizes on-site visit of experts to the university, prepares an evaluation report of the examined programs for the AEER Accreditation Board [3].

Experts of the Accreditation Centre of the Association for Engineering Education of Russia (AC AEER) form an integral part of AC working capacity and the image of modern engineering education in Russia. More than 150 certified professionals - deans, heads of administrative divisions, heads of departments, professors, associate professors, industry and governments representatives – annually benefit their professions dedicating time and efforts to AEER activities.

Most AC AEER experts start out by working as a member of the evaluation team during on-site visits to universities.

MINIMUM QUALIFICATION REQUIREMENTS

Potential AC AEER experts should meet the following requirements:

1. be interested in improving of engineering education.

2. be AEER member or express a desire to become AEER member before starting any activities as AEER expert.

3. have higher education and recognition in a particular field of activities.

4. have a degree in a relevant field.

5. have computer skills: be able to use the Internet, electronic mail, word processing programs (Microsoft Word) and PDF files.

Talking about a particular area of activity, it should be kept in mind that experts in their work have to deal with a variety of educational programs in engineering and technology. Currently, in accordance with the All-Russian classification of professional education, there are 29 enlarged groups of professions and areas of training in Russia; 17 of them belong to the engineering groups [4]. As of mid-2011 13 of 17 groups were accredited by AEER (see Table 1).

When we talk about the need for evaluation of expert activities efficiency first, of all we are interested in two characteristics: whether the level of his professionalism (education, skills, experience) contributes to the activities efficiency and what kind of person he is - intelligent, purposeful, responsible, committed, etc. (so-called personal and business qualities). The practice shows that high qualification, solid experience and high intelligence are not enough to guarantee effective work of expert within the audit of educational program.

Table 1. List of Specialties and Qualifications of Post-Secondary Education in Russia

Code	Name of the enlarged groups of professions and area of training	Engineering programs	Accredited by AEER programs
010000	PHYSICAL AND MATHEMATICAL SCIENCES		
020000	NATURAL SCIENCES		
030000	HUMANITIES		
040000	SOCIAL SCIENCES		
050000	EDUCATION AND PEDAGOGICS		
060000	PUBLIC HEALTH SERVICE		
070000	CULTURE AND ART		
080000	ECONOMICS AND MANAGEMENT		
090000	INFORMATION SECURITY		
100000	SERVICE INDUSTRY		
110000	AGRICULTURE AND FISHING INDUSTRY		
120000	GEODESY AND LAND MANAGEMENT	*	*
130000	GEOLOGY, EXPLORING AND MINING	*	*
140000	POWER ENGINEERING, POWER ENGINEERING INDUSTRY AND ELECTRICAL ENGINEERING	*	*
150000	METALLURGY, MECHANICAL ENGINEERING AND MATERIAL PROCESSING	*	*
160000	AVIATION AND ROCKET AND SPACE MACHINERY	*	*
170000	WEAPON AND WEAPON SYSTEMS	*	
180000	MARINE MACHINERY	*	
190000	TRANSPORT FACILITIES	*	*
200000	INSTRUMENT MAKING AND OPTICAL EQUIPMENT	*	*
210000	ELECTRONIC ENGINEERING, RADIO ENGINEERING AND COMMUNICATION	*	*
220000	AUTOMATIC DEVICES AND MANAGEMENT	*	*
230000	COMPUTER SCIENCE AND COMPUTER ENGINEERING	*	*
240000	CHEMICAL TECHNOLOGY AND BIOTECHNOLOGY	*	*
250000	REPRODUCTION AND PROCESSING OF FOREST RESOURCES	*	
260000	FOOD AND CONSUMER GOODS TECHNOLOGY	*	
270000	ARCHITECTURE AND CIVIL ENGINEERING	*	*
280000	PERSONAL AND SOCIAL SAFETY, ENVIRONMENTAL ENGINEERING AND PROTECTION	*	*
290000	MILITARY EDUCATION		

In the evaluation and selection of expert auditors European and American accrediting agencies use the term "competence" [5,6]. There are many definitions of competence, because different organizations and experts prefer their own interpretations of this concept. But finally most of the definitions actually mean a variation of two competency approaches – English and American. English approach interprets competence as performance standard or expected outcomes according to which employee's ability to act is measured. American competence approach describes the behavior required to work effectively. Within this approach the assessment correlates actual employee behavior with the description.

AEER ACCREDITATION CRITERIA

The first step in AEER public professional accreditation is a self-study process carried out by applicant university in accordance with AEER criteria. Nine criterions are approved by all international accreditation agencies – ENAEE members [7]. Only when all nine criterions are met, the program is awarded the EUR-ACE ® quality label (accredited engineer). In fact, before the on-site visit to the university and during the audit of the university, an expert gives a reasoned response to the questions listed in the right column of Table 2.

Usually an on-site visit to the university takes 3-5 days. During this time meetings with faculty, students, graduates of the educational program and employers are held. Within the visit it is important that the behavior of experts and the expected results correspond with the competence model; its key indicators are listed in Table. 3.

COMPETENCE MODEL FOR AC AEER EXPERTS

AC AEER expert community has identified a number of requirements for a competence model, which should be met to make its implementation practical and effective.

THE COMPETENCE MEASURING SCALES

There are many opportunities to assess the achievement of competencies by experts:

1. Binary scale
   - satisfactory
   - unsatisfactory
2. Three-level scale
   - Below Expectations
   - Meets Expectations
   - Exceeds Expectations

Table 2. AEER criteria outline

Criterion	Outline
1. Program objectives	Do the educational program objectives correspond with the university mission and the needs of potential constituencies?
2. Program content	Do the program outcomes meet the required criteria and correspond with the educational program objectives?
3. Students and study process	Does study process ensure learning outcomes achievement? Are students enrolled to educational program aware of planned learning outcomes and ways of their achievement in given time?
4. Faculty	Does the faculty meet the requirements needed to achieve learning outcomes?
5. Professional qualifications	
6. Facilities	Do classrooms, laboratory facilities, equipment meet the requirements needed to achieve learning outcomes?
7. Information infrastructures	Do computer classes, library, available information resources meet the requirements needed to achieve learning outcomes?
8. Finance and management	Do financial resources , organizational structure and university management processes meet the requirements needed to achieve learning outcomes?
9. Graduates	Are program graduates employed in accordance with their qualifications?

3. Four-level scale
   - O competence is not developed and expert does not seek to develop it
   - A need and possible to develop competence
   - B competence meets standard requirements
   - C expert demonstrates higher level than it is set by standard

Below there is Table 4 with a four-level competence scale. A chairman of the expert team can evaluate expert's work using this scale. This kind of information is important for AC AEER analytics. In case expert gets a significant number of A scores, he/she is invited to undergo additional training in AC AEER seminars. Figure 1 demonstrates a model diagram of an expert competencies assessment. Similarity of such diagrams of various experts allows forming groups of experts for advanced professional training and select an appropriate methodological support.

Table 3. AC AEER experts' competencies

Competence	Desired skills	Application during on-site visit to the university
1.Ad-hoc expert background	• Demonstrates awareness as an expert in accordance with the position held • Interested in lifelong learning in his/her professional field	• Able to apply expert knowledge to define how the educational program meet accreditation requirements • Aware of all updates of accreditation procedure and criteria
2. Effective communication	• Easily holds face to face interviews • Writes reports clearly and concisely • Holds focused briefings	• Interviews university staff to evaluate program efficiency • Writes short, criteria-based reports on the strengths and weaknesses of the program • Provides a thesis for the final interview hold by evaluation team • Inform the Chairman of all unavailable for evaluation team information (including from a self-study report),the prior and within the on-site visit
3. Interpersonal communication skills	• Friendly and naturally interacts with others • Listens actively and is interested in the topic • Unbiased and avoids personal prejudices • Decisive, not restrained his opinion out aloud • An expert in highlighting strengths and weaknesses of the educational program in a non-confrontational manner	• During interview have a strong willing to accept information from staff, administration, industry representatives and students • Evaluates the program in accordance with the accreditation criteria within a particular institution • Evaluates and expresses constructive opinion about strengths and weaknesses of the program
4. Teamwork oriented	• The willingness to accept information from members of the experts' team • Works with team members to reach consensus • Evaluates the success of the team higher than of an individual	• Compares his data with information collected by other team members for better understanding • Catches and listens carefully in order to achieve general result on the program • If necessary helps other team members within on-site visit
5.Professionalism	• Observes professional behavior and has proper appearance • Improves the process of program evaluation • Evaluates people honestly, and in accordance with the ethical standards	• Represents AEER and his engineering profession as a practicing professional • Tries to make suggestions on how to stimulate innovation and other efforts for continuous educational program improvement • Demonstrates respect to the university and its employees • always observes the code of ethics of AEER expert
6.Self-discipline	• Keeps within the meeting time limit • Focuses on the major critical issues and avoids details • Ready to take the initiative • Responsible at work with minimal supervision	• Formulates preliminary strengths and weaknesses of the educational program on the basis of the review materials provided prior to the visit • Focuses on the important results, effectively attracts additional data relevant to the used criteria and offers possible solutions • His distinctive feature is timely and high quality reporting to the experts team chairman • Makes critical recommendations where necessary

Table 4. Assessment of experts' competencies by the chairman

1. Ad-hoc expert background				
	Requires improvement A	Satisfactory B	Exceeds expectations C	Impossible to assess O
1.1. Knowledge of applying accreditation criteria	Demonstrated wrong understanding of accreditation criteria	Demonstrated awareness of accreditation criteria	Demonstrated an exceptional ability to explain accreditation criteria to others	
1.2. Knowledge of accreditation procedure	Demonstrated wrong understanding of accreditation procedure	Demonstrated awareness of accreditation procedure	Demonstrated an exceptional ability to explain accreditation procedure to others	
1.3. Leadership	Failed to provide adequate leadership	Provided the team with additional resources by managing within the on-site visit	Demonstrated a high level of team management, that provided good results of the visit	
2. Effective communication				
2.1. Information transfer	Chairman of the experts' team is not informed about the activities and contacts with university representatives	Provided the chairman with the new information in accordance with the new data	Was an active supporter of the chairman informing	
2.2. Final report	Written final report required significant editing	Written final report was effective. Key points were highlighted	Outstanding written report. Slight editing by the chairman was /was not required	
2.3. Interview	The interview was not conducted carefully enough and did not provide suggestions for program improvement	Effective interview allowed to determine the key points	Demonstrated exceptional personal qualities when conducting the interview in a confidential manner	
2.4. Suggestions	Made suggestions were too biased	Made suggestions for continuous improvement of educational programs and promotion of innovations	Was creative when making suggestions for continuous improvement of educational programs and promotion of innovations	
3. Interpersonal communication skills				
3.1. Communication	Not demonstrated effective communication	Was effective in communication with the program, students, teachers	Demonstrated an exceptional ability to prevent actual or potential conflict when discussing strengths and weaknesses of the program	
3.2. Prejudice	Was biased when evaluating the program	Demonstrated an unbiased approach when evaluating the program	Demonstrated an unbiased approach when evaluating the program	
3.3. Diplomacy	Was rude and aggressive towards team members or university representatives	Demonstrated ability to articulate in a diplomatic manner in difficult cases	Was decisive and spirited when making final conclusions	

4. Teamwork oriented				
	Requires improvement A	Satisfactory B	Exceeds expectations C	Impossible to assess O
4.1. Willingness to listen	Interrupt others, and tended to monopolize the conversation	Demonstrated a willingness to listen to other points of view during a meeting of the expert team	Encouraged others to express their point of view	
4.2. Willingness to help	Was focused only on his/her own tasks without voluntary will for assistance	Demonstrated a willingness to help other team members during the visit	If necessary, consistently offered assistance to other team members	
4.3. Cooperation	Demonstrated a limited ability to see different perspectives, or to seek a common point of view	Worked in collaboration with other experts to reach consensus	Demonstrated an exceptional ability to help the experts to find a common point of view and resolve the conflict, reaching a general consensus	
5. Self-discipline				
5.1. Prior to the visit	Was not prepared when he arrived in the university	Demonstrated timely performance of all tasks before visit to the university	Demonstrated performance of tasks prior to the visit and actively interacted with the expert's team chairman and / or team members	
5.2. Ability to "keep track of time"	Did not provide program enough time to prepare for additional requests	Demonstrated effective time management at university	Demonstrated an exceptional self-discipline and efficiency during on-site visit to the university	
5.3. Ability to respond	Delayed materials and did not respond to the comments of the expert's team chairman	Timely reported to the experts team chairman	Documentation was submitted ahead of time	
5.4. Self-discipline	Was disorganized in all aspects of the accreditation process	Demonstrated an effective organization in the evaluation process from first contact to final report	Was extremely effective, completed all tasks timely	
6. Professionalism				
6.1. Respect	Showed little respect in relation to the university	Showed respect for the university	Demonstrated a high level of respect for the representatives of the university during the meetings with them	
6.2. Behavior	Did not represent AC AEER in a proper manner within expert's team activities and final meeting	Showed respect for the university within expert's team activities and final meeting	Demonstrated superior ability to express respect for the university within expert's team activities and final meeting at uncomplimentary conclusion	
6.3. Ethics	Demonstrated misplaced arrogance in respect of other experts	Constantly observed the Code of Ethics of AEER expert	Set an example to other experts in the application of the Code of Ethics	
6.4. Decision making	When evaluating the program, based on his/her own opinion and not on the AEER criteria	Demonstrated expertise in making decisions when evaluating the program	Showed a brilliant professional decision making in the interpretation of criteria and characteristics of the program	

Note: Your choice should be explained when estimating competence with A score

Figure 1.Expert's competence evaluation example.

C																					
B																					
A																					
O																					
	1.1. Knowledge of applying creditation criteria	1.2. Knowledge of accreditation procedure	1.3. Leadership	2.1. Information transfer	2.2. Final report	2.3. Interview	2.4. Suggestions	3.1. Communication	3.2. Prejudice	3.3. Diplomacy	4.1. Willingness to listen	4.2. Willingness to help	4.3. Cooperation	5.1. Prior to the visit	5.2. Ability to "keep track of time"	5.3. Ability to respond	5.4. Self-discipline	6.1. Respect	6.2. Behavior	6.3 Ethics	6.4. Decision making
	Ad-hoc expert background			Effective communication				Interpersonal communication skills			Teamwork oriented			Self-discipline				Professionalism			

CONCLUSION

Today, the process of accreditation of educational programs is widely recognized as the most efficient factor to improve the quality of education. It is crucial to develop at universities systems of continuous programs improvement through an independent external accreditation of programs by national and international professional community. The formal outcome of an external examination is regarded as the credibility to the program from graduates' consumers, and the main result is a real quality improvement of educational programs.

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