

Maciej PIEKARSKI

Rzeszow University of Technology
 Faculty of Civil and Environmental Engineering
 Department of Engineering Geometry and Graphics
 Al. Powstancow Warszawy 12, 35-959 Rzeszow, Poland
 tel: + 48 17 865 18 39 e-mail: mgpiekar@prz.edu.pl

TEACHING OF ENGINEERING GEOMETRY AND GRAPHICS IN THE CONTEXT OF NATIONAL QUALIFICATIONS FRAMEWORK

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On the 1-st October 2011 a revision to an act „Law on the higher education” [1] came into force in Poland. It implemented National Qualifications Framework (NQF) as guidelines standardizing programs of the education, in a place of educational standards, so far being in effect. The essence of NQF is determining educational effects for particular educational areas into a way of a decree. The educational effects for specific programs of the education, drawn up individually by universities and their organizational units, should be compliant to them. The fundamental change consists in increasing the autonomy of the universities in drawing up programs of the education and replacing lists of contents, which student should learn during studies, with specifying knowledge, abilities and competence which he should have after finishing them.

Applying of NQF has been rescheduled in the time for one year into this way that programs of educating for cycles of the education starting in the academic year 2012/2013 must be already in accordance with NQF. Since the decree on KRK [2] was established in November 2011, and drawing up and accepting effects of the education is a multistage process, it can happen this way that due to the lack of the time, changes being supposed to introduce the completely new quality will have only formal character. One can hope in it that effects of the education aren't defined once and for all. Their systematic verification and the revision of programs of education based on its results, carried out by organizational units of the universities, is supposed to be a crucial factor taken into consideration by Poland Accreditation Committee while periodic evaluation of branch of study [3]. Situation requiring radical redefining programs of the education should be a chance to reflection also above of the topicality of issues taught from the scope of geometry and the engineering graphics, as well as of methods of teaching them.

Precious pointers on preparing programs of the education compatible with NQF are contained in the work [4]. The most important of them, which taking into account could correct quality of the didactics of geometry and the engineering graphics, are specified below :

- great modules (subjects) of study,
- compliance of effects of education for the subject of study with effects of education for the program of education (branch of study),
- education oriented for solving a problem ,
- majority of the classes at small groups, forcing active behavior and practical action,
- proper selection of forms of giving classes, methods of the education and ways of checking, whether effects of the education have been achieved,
- bigger using computer techniques in the process of education, at assuming the access to network sources from mobile devices,
- elimination of issues which are leading of achieving none of effects of the education determined for branch of study.

Realization first from demands requires assigning to geometry and the engineering graphics, not to the group of the basic subjects, but branch ones. Current reality in this respect is different, both formally [5] as well as practically. Organizational accounts, a tradition and competence of the teaching staff, different at particular universities and faculties, usually decide. Proposed assigning the subject would support also a realization the second demand. In the opinion expressed already previously by the author [6][7], the subject should link issues of geometrical shaping spatial objects with principles of their graphical representation in the technical drawing, being based on the applications appropriate to branch of study and using contemporary computer tools.

Taking into consideration branches of study belonging to the area of technical sciences, it is possible to regard that every graduate obtaining the professional title of engineer should can make the graphical mapping of the structure of the spatial object in the drawing and should correctly reconstitute this mapping. It is possible to regard being enough this scope of the qualification for such branches of study like technical physics, commodity science, environmental protection etc. Graduates of the faculties preparing to the creative design work (e.g. mechanics and the mechanical engineering, civil engineering) should additionally achieve qualifications in shaping the spatial structure of technical objects, whereas graduates of faculties preparing to the creative work, which results will be subject for aesthetic assessing (e.g. architecture and the urban planning, landscape architecture), also qualifications within the scope of the visualisation of the spatial structure of objects. Such a gradation of effects of the education would be in accordance with the current educational politics, which is supposed to enable to acquire qualifications on higher level of the education not necessarily within the same branch, which for qualifications were acquired on the lower level. The proposal to define detailed effects of education for each of exchanged scopes of qualifications will be specified during the conference.

Each of exchanged scopes of the classification demands different methods of the education and ways of verifying achieved effects. The e-tests [8] may be a good way both for education and verification of its effects for students of faculties, on which from graduates only basic qualifications are expected. The

tests prepared appropriately can be a base of the objective assessment of the student made quickly and even apart from hours of the contact with the teacher. In current reality, these students should also have a basic knowledge and abilities about computer aided designing software.

Students of branches preparing to the creative design work should be acquainted with issues of shaping and the mapping of objects related to professional issues. Shaping the ability by personal constructing drawings, both with graphic methods as well as at applying computer tools, will be necessary in educating them. Model subjects of works problem, integrating diversified issues and settled in issues of branch of study will be presented during the conference.

The last of demands exchanged before will have realized in the geometry and the engineering graphics by responsible defining the contents of the education into this way that they serve the realization of effects of education for particular branches of study. It should in the natural way eliminate issues, not finding the practical usefulness in today's reality, but current till now in school curricula as the certain kind of historical legacy of the nineteenth century descriptive geometry .

The National Qualifications Framework is distinguishing 3 categories of the qualifications: knowledge, abilities and competence. In the opinion of the author, geometry and the engineering graphics in the definitely greater degree are expanding abilities than the knowledge, but by situating in the plan of study as first from engineering objects can have an intense influence on shaping competence building the engineering ethos in graduates. It is competence consisting in the precision and the explicitness in describing spatial objects, as well as of keeping order and the care and of being guided by imagination and the creativity in taken action.

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