UDC 65.01:378

Implementation of Interdisciplinary Projects within Bachelor Degree program in "Quality Management"

National Research University Moscow Institute of Electronic Technology, Moscow, Russia

M.V. Akulenok

The article describes an example of an implemented interdisciplinary project within the framework of Bachelor Degree program 221400.62. The following aspects were defined: experimental analysis, advantages and specific characteristics of such projects.

M.V. Akulenok

Key words: project-oriented learning, learning outcome, interdisciplinary communication.

To achieve sustainable success in the global market, enterprises should not only improve existing approaches to business management, but also define new requirements to the personnel, which, in its turn, furthers new standards and specifications for graduate quality and learning outcomes. Advanced training programs focused on future job market-place requirements furthering the combination of graduate training activity approach with interdisciplinary components and professional-oriented education approach would be the relevant response to job market-place expectations, i.e. competitively trained graduate possessing such skills as creativity, risk management, team-player, self-development and organizational qualities [1].

Due to the reduction of course duration there is an acute necessity for developing new methods and tools to improve student self-development (SSD) performance and to overcome the existing formalism in education. All in all, the complexity and enormous knowledge volume results in the devaluation of "unconsumed" knowledge and skills forming the so-called "silent" zone [2, 3].

One tool of professional-oriented training focused on developing key competencies is the project method which is based on the synergy of parallel (or sequenced) integrated studied disciplines.

Complete implementation of the project method [3] is a very difficult task requiring not only the optimization of the curriculum itself, but also coordination of teamwork and feedback. However, this also involves the local optimization of the professional discipline cycle.

In NRU MIET the project method, i.e. modeling professional activities, was implemented within the framework of the program "Quality Management" as interdisciplinary projects focused on enhancing interdisciplinary communication and furthering the synergy effect. Such a project is considered to be a specific type of learning assignment stipulating those skills, abilities and knowledge shaped in two (or more) disciplines and targeting the applicable development of these skills, abilities and knowledge in this or that professional domain.

Specialists in quality management should not only manage quality management tools, understand and apply education standard requirements (as

compulsory courses of a curriculum), but also have engineering problem-solving competency in this or that professional domain, as well as being actively involved in engineering activities and having a positive economic behavior.

Pilot projects, integrating such disciplines as "Process Management", "Quality & Economy" and "Quality Auditing" were included in the specialist program (220501- "Quality Management")[4]. This experience was integrated into the Bachelor Degree program 221400 which included an interdisciplinary project involving such disciplines as "Fundamentals of Quality Assurance", "Process Management", "Quality & Economy" and "Certification of Quality Management System (QMS) Effectiveness." This project embraced both traditional term projects and virtual projects which assure sequential communication between above-mentioned disciplines. Further, the next stage is the implementation of parallel project sections relevant to the following discipline pattern: "Process Management – Business Modeling" and "Quality & Economy – Marketing."

The key aspect, combining all above-mentioned disciplines, is definite program learning outcomes (relevant to professional competencies), such as: (PC-1) analyze existing dynamics of development projects through relevant methods and analytical tools; (PC-4) apply knowledge appropriate to engineering speciality, including models, methods, tools, technology and algorithms for problem-solving; (PC-7) apply knowledge in quality management; (PC-10) prepare documents pertinent to quality management system and its monitoring; (PC-13) formulate targets and make risk-management decisions; (PC-17) select appropriate engineering tools to execute problem-solving tasks (project, research), define specific interrelations, model task-systems (problems), analyze and clarify reasons of such problems.

The following cross-cultural competencies (CC) are also attained: (CC- 3) communicate effectively with the engineering community and with the society at large; (CC-5) administer and execute regulatory documentation (policies and procedures); (CC-9) apply basic principles and methods of social, humanitarian and economic sciences in solving social and professional tasks.

Executed projects embrace the general principle of a specific product, service or production (as a rule, virtual). Nominally termed as "virtual" projects we do not exclude the possibility of practical project tasks, for example, focused on topics of on-the-job training or research and development projects.

Additional key elements of discussed interdisciplinary projects are:

- individual and team (3-5 persons) tasks;
- annual refresh tasks;
- balancing requirements and alignment of planned academic studies of project disciplines to the task itself;
- consultations;
- public presentation of team project results (every semester) as either reports or PP.

It should be noted that the above-mentioned list of disciplines does not exclude the possibility of more disciplines which could be included in this or that project. Individual tasks determine the relevant development of industry standard requirements, for example, in the telecommunication domain- standard requirements TL-9000 or in the microelectronics domain- SEMI and ASTM standards and others, as well as tailoring generalized approaches, requirements and methods of quality management to industry-based project.

Today's projects embrace four semesters, involving gradual learning of core disciplines.

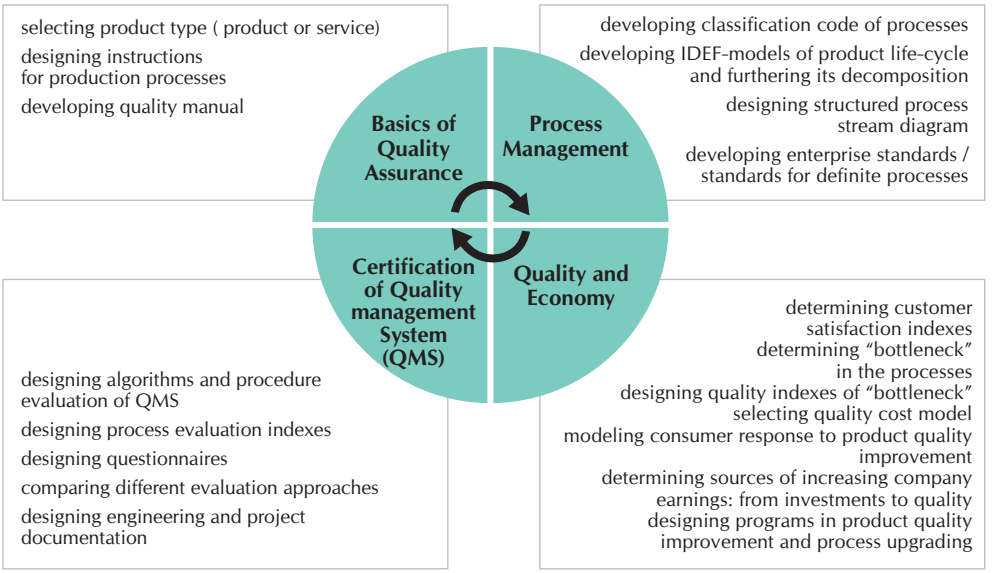
The project pattern and its content executed by students during each project stage is presented in Fig. 1 and Table 1.

It are be noted that alignment of structures tasks to the planned academic studies involves the application of qualifying tools and methods within in-class learning and furthering the implementation of team project tasks. This, in its turn, establishes monitoring of the

Table 1. Major Stages and Techniques in Interdisciplinary Project within the Framework of Bachelor Degree Program 221400.62. "Quality Management".

Semester	Major topic area	Stage content
4	Content-frame of quality manual (QM)	Selection of product type (product or service); Design instructions for production processes; Performance of standard requirements GOST ISO 9001; Quality manual design.
5	Process profile	Development of process classification code; Development of IDEF-models of product life-cycle and furthering its decomposition; Design of structured process stream diagram; Development of enterprise standards / standards for definite processes.
6	Quality cost model design	Determination of customer satisfaction indexes; Determination of "bottleneck" in the processes; Modeling consumer response to product quality improvement; Program designs in product quality improvement and process upgrading.
7	QMS Evaluation of virtual enterprise	Algorithm design and procedure evaluation of QMS; Design of process evaluation indexes; Questionnaire design; Comparison of different evaluation approaches; Engineering and project documentation design.

Fig. 1 Interdisciplinary Project Pattern within the Framework of Bachelor Degree Program 221400.62.



project implementation itself whereas a prominent part of this project can be observed throughout the in-class learning. Besides, positive recommendations in project implementation, based on in-class learning results, are formulated for each team individually within the framework of student self-development (SSD) activities.

This project method is consistent to the accumulating grade-rating system applied in many universities and facilitates in evaluating the contribution of each team-player in the project. The results of each project stage are evaluated in grades (from 5 to 10). Expected outcomes, performance indexes and criteria have been defined for each stage of the interdisciplinary project, including report drafting and presentation planning, as well as participation in the final stage-conference.

A diversity of positive advantages and characteristic features of interdisciplinary project development have been revealed and are the following:

- attained practical skills complement and enhance already obtained "theoretical" knowledge (disciplines) in required time, i.e. the so-called "Just-in-Time" concept;
- interdisciplinary communication is maximized through active instructor interaction of relevant disciplines;
- constructive environment is developed throughout in-class learning and SSD activities;
- effective use of teaching hours, including SSD hours;
- communicative skills and team-work abilities are shaped;
- practical experience in public presentation and further academic assessment are developed.

The improvement of graduates' competitive abilities within job market-place is to be expected as the major positive result of this project method.

REFERENCES

1. Pokholkov Yu. P. Advanced Training of Elite Specialists and Global Professional Teams in Engineering & Technology / Pokholkov Yu. P., Agranovich B. l. // Engineering Education. – 2007. – № 4. – pp. 4–9.
2. Pokholkov Yu. P. Approaches in Developing National Doctrinal of Engineering Education in Russia within Modern Industrialization: problems, targets, challenges / Pokholkov Yu. P., Agranovich B. l. // Engineering Education. – 2012. – № 9. – pp. 5–11.
3. Project Method in Designing Elite Technical Education Programs / Akulenok M. V., Gulidov D. N., Pospelov A. S., Larionov N. M. // Elite engineering education 2004 : Regional Scientific Conference: Conference proceedings/ MIET. – M., 2004. – pp. 9–11.
4. Akulenok M. V. Project Method as a Tool in Shaping Key Competencies // Modern Technologies in Russian Education System: Conference Proceedings of IX Russian Scientific Conference / IRIC PSAA. – Penza, 2011. – pp. 8–12.