lectures, stage-by-stage introduction of parameters enhances understanding and memorizing information in comparison with notes on the board, where sometimes it is impossible to place a large amount of comments without erasing some parts of figure.

In addition to the mentioned above, one can note that the slide design itself draws students' attention to the key points of multimedia lecture by means of highlighting the text in colour different from the colour of the main text or framing «the main idea».

Thus, our experience in multimedia lectures allows for the following conclusions. Multimedia approach to lectures provides significantly their visibility. Visualization, brightness, dynamics of figures performed with multimedia computer tools help to explain the most complicated phenomena and processes to learners. Students better understand complicated information requiring visual support, moreover, multimedia lectures shorten the time of learning information and improve the efficiency of academic activity in general.

Some sections of multimedia lectures were included in programs of different transmission design. The program of belt transmission design in its hauling capacity was given the protection [6].

Multimedia lectures obtained four-year approval, correction, and are completely used in academic process at the department of «MP and PPD», VolgSTU.

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Scientific Knowledge Concept: Case Study Technology and Its Practical-Oriented Application

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Shaping the competences of a Master-student within the framework of Federal Education Code new generation of Higher Professional Education is implemented through an innovative methodology, i.e. case study (portfolio). This methodology is coupled with such aspects as self-control, cooperativeness and, especially, teamwork. This article is a continuation of previously published papers [3, 4, 5].

Key words: scientific knowledge concept, shaping Master-student competences, innovation in engineering education.

New generation programs of Federal Education Code (FEC) oriented at the competency-based approach are focused on the development of those tools involved in the shaping of Master-student competences, as well as innovative methodological documentation. Such a discipline as "Philosophy and Logics" for Master-students of different engineering domains has been introduced in Tyumen State Oil-Gas University. The above-mentioned problem is solved by the application of innovative teaching methods in combination with designed integrated courseware, which, in its turn, are being tried and tested within the framework of the Master-student programs.

Besides, the existing traditional tools, certified teaching methods, management and monitoring organization procedures, newly updated methods and techniques have also been introduced. The proposed learning-teaching package includes course schedule, lecture and practicum plans, and self-instruction guidelines – for tutorials and self-directed learning. The guidelines include a set of assignments, forms and possible procedures to determine the qualitative and quantitative parameters for learning outcomes.

The methodological recommendations in defining the quality evaluation of the learning outcomes are as follows: shaping Master-student competences, i.e. the readiness (including motivation and personal qualities) to demonstrate one's abilities (knowledge, skills, experience) in future professional and research activities under the existing conditions of today's national science and domestic economy. Learning outcomes are determined by the acquired competency qualifications of a Master-student both after the completion of a course and education program (specialization). Competency qualification is expressed in a score-system integrated as a learning table-matrix, as well as final assessment as a credit test.

Learning outcome elements are those independent abilities (knowledge, skills, and experience) which could enhance a Master-student's performance in research of this or that topic, field or specialization and further his/her research results in step-by-step practical application.

Design goals are to investigate the common characteristics of scientific knowledge in the domain of logics oriented at science and technical-engineering methods; and to explain their interdisciplinary and cross-disciplinary interaction. The discipline "Philosophy and Logics" is included in the general courses of Humanities and Social Science-Economics. The objectives of this discipline are as follows:

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- to develop an interest in background knowledge;
- to enhance the need for critical analysis of today's state-of-the-art;
- to understand the concept of integrated global scientific-legislative proceedings and its diversity in conditions of economic and cultural globalization.

This course is an introduction to scientific (i.e. engineering) knowledge methodology relevant to the Master-student major. The basic tasks are:

- to promote the development of a system-based conception of scientific knowledge, step-by-step research methods and procedures, shaping and developing skills in independent research;
- to consider science as a specific activity oriented at the generation of new knowledge;
- to analyze the development patterns of scientific knowledge, accumulation and alteration of research elements such as subject, tools, research methods, aspects of scientific communication, types of disintegrated and cooperative research;
- to identify and update the role of scientific knowledge in the development of the human society and industrial production under today's conditions.

Learning outcomes state that the Master-student should internalize:

- scientific-philosophic and philosophic methodologies, fundamental base and universal scientific knowledge to further deep analysis and understanding of the existing processes within contemporary science and R&D management;
- major principles and methods, structure and topics of contemporary scientific knowledge;
- specific features of formatting research papers (annotation, review, abstract, article, master thesis, monograph) and mechanism of personal participation in the research itself.

Based on above-mentioned factors the Master-student should:

- employ developed skills in unbiased and multi-dimensional assessment of focus areas and schools in the sphere of professional activities;
- identify the scientific, theoretical, methodological, and practical aspects of studied issues;
- logically formulate, present and reasonably advance one's personal representation of discussed research problems;
- actively participate in scientific dialogues and discussion, correctly ask and answer questions;
- actively assimilate the material, reinforce practical skills and have a deep understanding;
- study independently, organize procedures in self-study groups and team work;
- perform independent research on this or that research specialization (annotation, note-taking, abstracting, formulating thesis and articles).

The humanitarian component of the engineering education provides such opportunities for a Master-student as:

- "distinctly to define the structure of contemporary engineering and technical knowledge, be able to analyze the socially-important problems and processes, apply creativity approaches in different professional activity domains;
- possess the principles of thinking, know its laws and be able to apply them in research, analytical, project, engineering, organization, performance, pedagogical activities;
- have skills in oral and written communication to enhance a high-level research and pedagogical activity level;
- be able to acquire new professional knowledge by applying updated learning technology" [1, p. 3-4].

The discipline "Philosophy and Logics" involves the Master-student personal development in the process of which one would be prepared for independent research; development of an algorithm-related system of practical skills based on topic selection, relevancy, delimitation of the subject, topic, target and goals, problems, analysis of the level of theoretical and methodological development issue, planning and scheduling research, referencing, writing annotations, reviews, reports and notes, selecting key words, compiling glossaries; procedures in testing research results, preparing written tasks, theses, articles, references based on the standard reference system according to GOST 7.1-2003 [2].

Different methods in shaping competences are combined in accordance with such factors as the level of Master student qualification and previous learning level. They include:

- simulation methods: merging Master-student research competences with future professional activity conditions through situation tasks based on contextual learning, which, in its turn, provides integrated assessment of several attributes simultaneously;
- integrated control methods developing self-assessment and peer assessment focused on the ability to conduct behavior corrective actions and improve one's achievements; combination of group and peer assessment methods (peer consultations and reviews; annotations of essays, projects, research phases, pair/group self-assessment), including systems of table and card material;
- feedback methods: team, group, mutual, and self-diagnostics of the creativity level in problem-solving;
- corrective methods: developing internalization skills of independent expert assessment and conducting "error correction" including expert analysis of potential employers, professional associations, and enterprises;
- innovative methods: application of modern support - based IT, systems and programs providing systematic and independent control of learning outcomes, on-time learning trajectory correction (EDUCON system, electronic resource – e-Library.ru).

Evaluation of research results show that the proposed innovative approach tasks and objectives being implemented into the engineering education foster: transition from individual competences to the development of integrated (complex) and interdisciplinary competences; transition from the passive "estimator" in the assessment process to the active "participant" in dialogues and polylogues, and, consequently, formulating the answer content or shaping a skill; changing the nature of the results: from single 4- level grading as one unit (1,2,3 assessment + test) to complex grading (designing case-study/portfolio, including individual Master-student research package relevant to practicum topics).

Assessment of the discipline include: formative assessment, midterm assessment (credit). The Master-student is informed about the specific types and procedures of formative assessment and midterm assessment throughout the first training month, and this information is duplicated in EDUCON system applied in Tyumen State Oil-Gas University [3].

An important component of the learning-teaching package is the monitoring-test materials and assessment tools. Readiness for future research activities in preparing the Master-degree thesis is evaluated by an integrated (complex) assessment system algorithm, including individual work (i.e. essays, glossary, annotations, notes, reviews, references, bibliographical descriptions, articles indexed by RF Higher Attestation Commission, presentations) and step-by-step execution of the research itself, structured according to the requirements (title page, contents, introduction,

theoretical section, practical section, conclusion, references, appendices).

To shape the Master-student competences, the assessment tools are integrated into the innovative methods and on-line tools (peer assessment, teamwork, role games, credited and expert assessment, case-study annotation combined with traditional assessment tools (oral exams, tests, essays, glossary, written examinations), as well as assessment-measurement materials (electronic-form tests, homework, interviews, electronic-class).

The obtained learning results involve a complex of competences, knowledge, skills and experience in research activities, further practical research application to selected Master-student problem-topic. These integrated professional and universal competences are that complex which a Master-student should possess after course completion (self-instruction, ability to present with relevant explanations).

Structure-matrix competences (extract from Federal Education Code / FEC) with detailed description of the generalized and specific competences in accordance with the Federal Education Code generation 3+ is depicted in Table 1.

The number of required presentations to be evaluated is about 3-7 for each class, therefore, all in all, 18 module cases. The grading system includes from 3 to 7+5 case studies; the minimum credits (score points) for a term-54 (at 51), maximum-126 (credit mark = 100). The Master-student should know the principles and methods of research information, algorithms and research stages; be able to perform intellectual operations with scientific information focused on acquisition, selection, presentation, comprehension, interpretation, comparison, operation,

Table 1. Structure-matrix of competences

Generalized/ specific competences	Index (FEC)	Competences (FEC)
Ability to understand the concept and sense of information in the today's society development	CC–1	Analyze, identify, understand information and undertake problem identification, formulation, and solution
	CC-7	Improve personal and organizational performance and be able to detect and adapt to changing conditions; obtain new knowledge in technology, engineering, mathematics, sciences, humanitarian, and social studies
	CC-10	Apply an understanding of many economic, social and cultural issues in the consequent social, business, and engineering decisions
Ability to work in a team	CC-3	Collaborate in teams to accomplish a common goal by integrating personal initiative and group cooperation

correlation, analysis, evaluation, systematization, classification, synthesis, generalization, abstraction, verification-simulation, inference; writing annotations, reviews, lecture-notes, abstracts, articles; organizing key research steps and components of Master degree paper.

Mid-term assessment demonstrating the case-study method results were published in the Conference proceedings of Tomsk State University, within the framework of the Russian Association of Engineering Education [4, 5].

Thus, the innovative integrated application of the case-study method (portfolio) interlinked with organized self-control, cooperativeness and teamwork exhibits practical-oriented results. In this case, engineering education in Russian universities is advancing towards the existing international standards.

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