also its resource efficiency. The device name with a brief description can be proposed by the instructor or invented by the students. The goal of the bankers and elective administrators – select the device that would guarantee maximum profit. The ecologists should verify the proposed device environmental safety. The consumers can be either students or instructors from other groups.

Active teaching methods could include watching English videos. For example, the students have a list of questions which he/she should answer during and / or after watching the video. The students review a set of questions, then exchange questions between each other, checking the correct answers and adding necessary information.

Oral test involves debates devoted to such topic as "Who generates the development of a society – an engineer or a scientist?" [3].

It should be noted that the students compile a glossary, i.e. they write down 5-10 words in each class throughout the semester. The written test involves writing an essay based on a topic associated with the student's future profession and including as many glossary words as possible.

The students highly praised the application of above-mentioned active methods in the teaching process. The questionnaire survey showed that the students actively and thoroughly prepared their study assignments. According to the student-respondents, such active methods as debates, discussion, seminar-confetences have two advantages: (1) monitoring one's communicative skills and (2) depth-in understanding of specific topics associated with the student's future profession.

Thus, the following methods applied in teaching the discipline "Professional Content-based English Language" embrace such skills and abilities as:

- activation of thinking and behavior;
- motivation -promotion in learning, teaching process management and personal engineering activities;
- administrative response to teaching process;
- understanding technological processes, engineering problem – solving and their promotion;
- experience exchange (personal and professional);
- motivated interest in studying engineering;
- material acquisition and consolidation (in Russian);
- development of individual, intellectual and behavioral skills and abilities under non-standard conditions;
- english proficiency for graduates;
- implementation of CDIO standards;
- enhancement of engineering education.

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Papplication of International CDIO Standard and Innovative Approach in the Methodology of Scientific Creativity

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Innovative methods of scientific work combined with the international CDIO initiative criteria are a new approach to engineering education. The article presents the assessment tools and evaluation techniques which can be applied during various master's thesis project stages, with main focus being paid to "production" in parts «testing» and «validation». The present article is the continuation of the work done previously.

Keywords: innovation in higher engineering education, methodology of scientific research on the particular algorithm.

Engineering education of the previous period consisted in the development of the following chain: «learning – engineering knowledge development – skill acquisition - practice». The essence and spirit of the CDIO International Program are focused on development of features of engineering education relevant to the contemporary state of society, science, and technology. Thereby, academic process implies the following elements: «learning – practice – engineering knowledge development – practice – skill acquisition – practice – outcome correlation – practical application of the whole knowledge volume». Further education under the slogan «lifelong education» forms an individual «learning trajectory».

Competence approach to higher engineering education sets the task of tool development for future master's competence formation and corresponding innovative methodical supplement for their realization. CDIO program sets a through goal: «Graduates are to be ready for complex engineering activity: Conceive, Design, Implement, and Operate engineering products, processes, and systems of the contemporary environment based on team work of specialists» [3, p.5].

CDIO standards are focused on «eliminating the contradictions between theory and practice in engineering education» through «enhancement of practice-oriented learning process as well as introduction of problem and project learning techniques» [3, c.2]. The given contradictions include a gap between theory and practice, irrelevence of educational practice to the level of contemporary scientific theory development also predetermined by such an unprecedented achievement as IT-technologies. According to the researcher's statement, cofounder of Concept Labs CA, chief engineer of BT Labs P. Cochrane: «Imagine this school with children that can read and write, but with teachers who cannot, and you have a metaphor of the information age in which we live» [4, 5]. It is referred to school, but this feature is also relevant to the stage of higher education.

At Tyumen State Oil and Gas University a propaedeutic course of «Methodology of scientific work» was introduced for masters of major «Electrical Power and Electrical Engineering». Its key task is preparation for master's dissertation. It is performed by means of innovative developments in the sphere of scientific creativity methodology

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combined with the focus on masters' knowledge formation about the key stages of international standard of CDIO engineering education (program «4P»). An essential part of learning-teaching process is monitoring-testing materials (didactic), and monitoring-assessment means, since tests are of low efficiency due to the variety of research themes. Formal part of research in the form of Master dissertation is checked for consistency to GOST standards by a code manager. The question is how to arrange an objective assessment of the projects? How to overcome subjectivity? What are the assessment criteria? Can they be strictly specified?

Suggested technology implies application of such methods as annotation, definition of key words, abstracting, reviewing as innovative elements forming evaluation of the developed project both in general and in parts. In this case the essence, idea, assignment of annotation and report are not mystery for master students, as a result masters attain the idea of difference of maser's dissertation as a research project from a report overcoming an annoying erroneous approach typical for the previous stages of self-learning.

The situation with assessment of mater dissertation content is more complex and interesting (testing, validity checking). Suggested technology suggests consistent and interconnected performance of mutual monitoring allowing for «feedback» between researchers, basic forms of mutual monitoring being formalized as well, performed by using a number of monitoring-assessment tools in the form of tables completed by students. For example, the task is given to mutually annotate the materials of dissertation obtained at the intermediate stage. At the lecture it is explained what annotation is, how sections «summary» and «keywords» should be written, as well as what goals, tasks, and principles of reviewing material are, what the difference of formats is, correlation of annotation/reviewing/note-taking procedures with the elements of personal research work in the course of an engineering project. A review is a brief version of three or more sources following author's logic. In contrast to annotation a review contains comments for the key statements of the text, suggests «a reader's thoughts on the margins», note-taking suggests a thorough quotation etc. Then, the task is briefly set in three stages: 1. individual 2. pair 3. group. At the first stage «the task for independent work is given individually»: students write a mini-review (volume of 3 pages) based on the material of notes from three and more articles, the review text being connected with quotations, and the quotations – with the references. The 2-nd stage of «pair work» is to check the content of review working in pairs, perform error correction. In this case «Task for coordinator (monitor)»: distribute the tasks, follow the course of performance, answer the questions, collect the results, arrange checking in pairs, collect the results, check the quality of performance selectively. Such technique provides the interaction of future engineers in a team, a chance to ask each other questions, to give advice, mutually clear up the general problems and search for their solutions. The 3-d stage is «group discussion», when the «latter» developments are presented orally; master-students are to listen, ask questions, and give advice to a presenter on error correction.

Checking validity of the project performed at the stage of research feasibility study («Implementation» in terms of CDIO) can be made by means of scientific methods of annotation or reviewing. Mutual annotation (recital and unbiased), abstracting (descriptive and evaluating) and, particularly, reviewing (evaluating and discussing) of the research materials serve as techniques of students' mutual monitoring. For example, three times within the academic course master -students perform «a task of independent work in pairs: exchange the cases with materials of master dissertation, check their content, present the written analysis

according to the offered scheme (form) or in a free format, put a checker's signature (in case of non-critical attitude the results are selectively checked again, the cause may be absence of comments, remarks, questions etc.). A checker fills in the column «correcting actions» - «error correction», or answer the questions defending the parts of research. The monitor's task is to arrange «pairs» of reviewed-reviewer using the principles «strong student-weak student», «strong student-strong student», or randomly; hand out the forms, collect, check out their completion, countersign with the words «checked, meets the requirements», «checked, should be revised (with reason)».

This algorithm made great impression on male master-students as, in the course of the first business game they could, apart from the expected knowledge enrichment, compare their level of skills-competence-qualification with that of other group members brining the elements of competitiveness. Female master-students showed higher degree of loyalty, inclination to assign «hidden» strengths to an opponent. Hence, at the first class «Selection of research theme» during 5 minutes of the business game «Hello, what do you do?» a group of 20 students selected: 1. The most topical (interesting) theme of master dissertation, 2. The most extraordinary theme, 3. themes - «doubles». There was even so to say «side effect» as soon as students solved some super-problem that had not been set by the teacher – they managed to guess who of master-students joined after bachelor graduation of similar major «automatization of power systems» from Tyumen State University of Civil Engineering and who came from classical Tyumen State University. Results served as a particular placement test permitting for definition of the level of initial skills and competences and using the intellectual potential of every student. As a rule, the level of master-students from foreign countries (Turkey, China, Kazakhstan) is not lower than that of the bachelors-graduates of Russian regional universities.

The major task defined by the section «Standard 1 – CDIO as a context of engineering education» suggests «accepting the principle according to which development and realization of products', processes', systems' life cycle takes place in the course of «conceive – design – implement – operate» model. The model defines the content of engineering education» [3, p. 5]. The applied task of engineering education resulting from the idea of CDIO is development of monitoring-assessment means as well as formation of ability to self-evaluate in accordance with objective criteria, including testing and validation of the project at the Implement stage. To develop steady skills of evaluating research, engineering products, schemes, processes, algorithms, solutions of industrial and production problems, a conditional-formalized technique of reviewing based on filling-in the form is used in addition to direct informal discussion, analysis, criticism. A fragment is shown in Table 1.

In the form fragment is given as an example, criteria and sections of assessment being at the development stage with regard to channels of «feedback». Thus, statements formulated by the master-students in the course of independent work are preferable as they reveal: 1) database for the development of general criteria of evaluation applicable for their engineering activity, 2) new ideas and approaches, 3) new problems for practical classes 4) challenges that should be managed at the nearest class 5) the form of training. Formalized form of review can serve as a «supporting document» that reflects the state of engineering project at this or that stage of research.

The parts for final assessment analysis at mutual reviewing the materials of master dissertation also include: title page, plan of dissertation, and the following parts – relevance, degree of problem development, theoretical background, methodical background, subject, goal, objectives of research, problem statement,

Table 1. Fragment of Review for Master Dissertation

Review of research project by Master __Name, Surname, group_

№	Name of dissertation section, volume, design	Relevance to the requirements of design, GOST, CDIO international standard 1, industry documents and requirements	Logic of narration, its forms	Scientific validation or corresponding supporting documents	Evaluating judgments: (8 positive and 2 negative notes), tips for error correction	Corrective actions
1	2	3	4	5	6	7
1	Theme of research	Approved /not approved by the department	Relevant/ irrelevant (explain why)	For example: «included in assigned for the department commercial agreement, approved by the department order », «presented at V. I. Potanin's contest» etc.	For example: «reduce the number of words», «specify»	Enclose the abstract of the order

current hypothesis, program of research performance.

According to CDIO International Standard development of engineering education «is to have the form of continuous enhancement and integration into the international education environment» [3, p. 2]. Engineering developments of international level and significance are impossible without access to the world achievements of engineering education, technology, and methodology. The presented methodology of the discipline «Methodology of Scientific Creativity» is focused on implementation of CDIO standards. The intermediate results of testing were published in the materials of conferences held in Tomsk State University, Tomsk Polytechnic University [1], Tyumen State Oil and Gas University. They were also represented at the events held with the support of Association of Engineering Education of RF [2].

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