

# Technologies of Student Testing for Learning Quality Evaluation in the System of Higher Education

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Received: February 27, 2015 Accepted: March 29, 2015 Online Published: July 28, 2015

doi:10.5539/ies.v8n8p141

URL: <http://dx.doi.org/10.5539/ies.v8n8p141>

## Abstract

The paper deals with technology of students' achievement in the area of educational activities, methods, techniques, forms and conditions of monitoring knowledge quality in accordance with the requirements of Russian higher education system modernization. The authors propose methodic techniques of students' training for testing based on innovative and traditions approaches, development of the system of student's competences evaluation in the course of teaching using current educational technologies in higher institutions. Pedagogical testing is represented as a set of instruments that allows assuring systematic monitoring and objective evaluation of students' professional training quality in the course of entire education process, defining stages of tests carrying out and also ways and means of educational results adjustment. It's feasible to consider the system of criterion-referenced tests a main method for pedagogical testing organization. It consists of tests of a specific form, certain content, increasing difficulty, created for the purpose of quality increase in professional education of university students. Testing as one of monitoring forms should be on an equal basis with traditional solitary and control works. Combination of all kinds of control allows the teacher to complement education process in a more qualitative manner. The expected result is creation of the organization model of the system of students' knowledge evaluation based on elaborated vocationally-orientated test materials that evaluate competences included in the requirements of Federal State Educational Standards of Higher Professional Education of the third generation.

**Keywords:** test, technology, testing, module-rating system, monitoring, knowledge evaluation, local information systems, information technology

## 1. Introduction

Signing of the Bologna declaration caused the modernization of the Russian higher education system. The declaration puts an emphasis on the need for interrelation of European education and the labour market, its market orientation strengthening, and demand for graduates. Applying the principles of the Bologna process and taking into account European Standard of Quality Assurance in Higher Education, the university sticks to the following conception: suppliers of higher education take prime responsibility for its quality and assurance; incentive of quality culture development in higher education institutes; development of processes by means of which HEI may demonstrate their record keeping; quality assurance for the purpose of accounting is completely equal by importance to quality assurance for the purpose of education process improvement; educational institution's demonstration of their activity quality both nationally and internationally (European Standards of the Bologna process, 2005).

The study novelty is development of students' knowledge evaluation system that addresses qualitative, organizational aspects of knowledge evaluation using state-of-the-art educational technologies and their scientific rationale.

The object of the study is students' knowledge quality control in higher institutions.

The subject of the study is testing technology for evaluation of students training quality in higher institutions.

The purpose of the paper is development of evaluation system of students' knowledge, skills and abilities in the course of teaching using current educational technologies in higher institutions.

The paper is concerned with theoretical and scientific foundation of the use of high technologies in the system of students' evaluation by the teachers of North Eastern State University, addressing qualitative and organizational aspects of student's knowledge, skills and abilities evaluation with the use of modern state-of-the-art educational technologies and their scientific rationale.

The expected result is creation of the organization model of the system of students' knowledge evaluation based on elaborated vocationally-orientated test materials that evaluate competences included in the requirements of Federal State Educational Standards of Higher Professional Education of the third generation.

The methodological base of the study comprises of guiding methodological principles of system analysis that provides specialists' professional training process research; person-oriented, competence-based and technologic approaches to specialists' professional training quality control process in higher institutions.

Specialist's new qualification model involves such requirements to the graduate as skills in self-acquired knowledge and professional development; ability to transform gained knowledge into innovation technologies and specific solutions; readiness to social and occupational mobility, etc. Over the last years requirements for increase in pedagogical control quality, search for better forms and methods, its efficiency and optimization have increased.

## 2. Literature Review

Pedagogical science has a whole bunch of tools and methods, which can contribute to achievement of modern objectives of education. Many researchers' works are concerned with theoretical development of the problem of students' professional training quality control assurance in higher institutions. In particular, the place of pedagogical control in the structure of educational process, its functions, forms, and methods were rationalized in the studies of Arhangelsky, Bespalko, Babansky, Pidkasisty. The issue of students' professional training quality monitoring procedure and arrangement was addressed in the works of Selevko, Kareva, Shuhardina, Zukerman. The analysis of the studies of Alexandrova G. N., Bayukova N. O., Nebab A. N., Razumovsky V. G., Rudometova L. T., Shlangman M. K. allows noting that training (didactic) games, development of case studies, pedagogical tasks solution, modular and test control are alternatives for traditional monitoring means of students' professional training quality. Currently pedagogical theory and practice have gained particular experience of the pedagogical testing use in the educational process of higher education institutions. The studies of Zhukovskaya Z. D., Kovalyova G. S., Neyman Y. M., Yaransteva N. V. point out that pedagogical testing in comparison with other control means is more advantageous as opposed to traditional forms of students' training quality evaluation. The analysis of researches regarding the problem under discussion shows that for today there are research papers that define theoretical and methodological background of testing use in pedagogical practice (Avanesov V. S., Neyman Y. M., Zhukovskaya Z. D., Shmelev A. G.). Many specialists engaged in testology (Bobylyov B. G., Kareva L. A., Subetto A. I., Selevko G. K., Yaransteva N. V.) emphasize manifold possibilities of testing in educational process enhancement. A great deal of studies are concerned with the problem of pedagogic tests use in the context of learner-oriented teaching (Bondarevskaya E. V., Bayukova N. O., Davydov V. V., Zankov L. V., Rudometova L. T., Serikov V. V., Unt E. I., Firsov V. V.). There are published papers, the authors of which consider individual questions of theory and practice of mass and adaptive testing, the use of educational information for quality diagnostics and examination of in education (Abramyan T. V., Granitskaya A. S., Mayorov A. N., Selevko G. K., Zukerman G. A., Shadrikov V. D., Shlangman M. K., Yakimanskaya I. S.). Thus, development of pedagogical set of instruments that allows objectively and efficiently exercising the process of continuous and all-around rating of students is necessary. Higher education institutions flow to competence-based model of students' training that involves reconsideration of educational process and introduction of innovation pedagogic technologies.

Introduction of competence-based approach involves the use of point-rating system (module rating grade by subjects) to evaluate students' educational competences, continuous monitoring digestion of educational materials and increase in objectivity of students' educational work quality assessment by teachers. Point-rating system of students' educational competences evaluation (PRS) is also effective in the course of monitoring quality of training by curriculum disciplines and promotion of students' methodic work both in-class and out-of-class (Baydenko, 2005). Module training is based on the following central idea: the learner should learn by himself, and the teacher has to manage his learning: to motivate, to make arrangements, to coordinate, to consult, to monitor, i.e. the teacher's role and part in education process is dramatically changed. Teacher sets a task to motivate students, to carry out their educational and cognitive activities in the course of module, and directly consults learners. As a result of teacher's role change during classes the nature and content of his or her preparation to education process is also changes: now the teacher not only gets ready to better explanation of

new material but to better management of student's activity.

### 3. Methods

North Eastern State University (NESU) regularly uses module-rating system of education process arrangement and management. Rating system successfully functions based on used infoware and computer technologies supported by the information network base of the university. Module-rating and point-rating teaching systems are focused on activity and achievements assessment of the student. An apparent advantage of this system is that not only students' knowledge and skills are evaluated but their personal qualities: active position, nonroutine decision of set problems, ability to organize a group for achieving the object in view, etc. One of required properties of the system is its transparency, that's why there's rating plan for each discipline on the website of the university, where anyone may check it out. Rating-plan defines sections of each module and assessment criteria with specific gravity of each indicator. Regarding the results of each module intermediate testing is provided, and upon completion of discipline studying students pass final test, which includes topics of all modules studied. Based on the principles of personality-activity approach the student has a right to select the form of final evaluation: rating grade or traditional form of passing examinations and passes.

The situation of competence-based approach introduction into higher education experiences shift from traditional testing to testing developed on the basis of pedagogical measuring theory (psychometrics, IRT theory, testology).

The new theory of tests is based on mathematical models, which provide most unbiased results of testing. Thus, Rasch model is used as one of main models (logic, one-parameter):

$$P = \frac{s}{s+t} \quad (1)$$

Where  $s$ —test-taker's level of training,  $t$ —test level of difficulty,  $p$ —probability of task correct execution. In such a way, results of pedagogical measuring depend on the interrelation of two main factors of pedagogical process—knowledge level and difficulty of tasks presented to learners. The same test-takers get high points when tasks are relatively easy, and low points when tasks are difficult. The dependency of test tasks evaluation difficulty is the same: difficulty of these tasks becomes underestimated in a strong group, and overestimated in a weak group. The problem of specified pedagogical interrelation was cracked in 1952 when George Rasch suggested his mathematical model for interrelation of knowledge level and difficulty of tasks. Today this model is considered a method of latent analysis and makes it possible to define both by means of step-by-step approximations.

#### 3.1 Pedagogical Testing

Pedagogical testing is represented as a set of instruments that allows assuring systematic monitoring and objective evaluation of students' professional training quality in the course of entire education process, defining stages of tests carrying out and also ways and means of educational results adjustment. It's feasible to consider the system of criterion-referenced tests a main method for pedagogical testing organization. It consists of tests of a specific form, certain content, increasing difficulty, created for the purpose of quality increase in professional education of university students (Andriesh, 2008).

Student's knowledge quality testing is innovative technology of education quality evaluation, which expresses quality of conformance to federal state educational standards. Testing is one of knowledge control forms in the framework of the institutional system of students' training quality and is used along with other types and forms of control. It is testing that can motivate students' active cognitive and creative activity for the whole period of education process. Various kinds of pedagogical testing of knowledge and skills are used in the system of higher education: entrance testing (at the beginning of education); current testing (during education), borderline testing (upon topic completion), final testing (upon subject completion), delayed testing (control of "residual" knowledge some time after topic or course studying). Tests used for working with NESU students for the purpose of knowledge control are diverse and include: cross choice (selection of pairs from two blocks by some or other features); alternative choice (selection of one answer of the offered); multiple choice (selection of one answer of the three-four offered); ordering (making a connected text of fragmented paragraphs, sentences, placing them in a logical sequence or a sentence of words); conclusion/ending (free answer or formulation of student's own evaluation); replacement/substitution of particular words, phrases, dates, etc.; transformation of proposed expressions, sentences, etc.; answers to questions; close-test (reconstruction of missing words in a text), such test can be based on multiple choice or it may not have it at all, etc.

#### 4. Results

Gained experience of pedagogic testing revealed both benefits and drawbacks in the process of use for test measuring materials knowledge quality evaluation. The benefits are the following: substantial time savings (it takes one hour to assess a group of 20-25 people while common exams take 6-10 hours per group); savings on high-skilled teachers' salaries (testing can be carried out without teachers); high objectivity and consequently weakening subjective factor of teacher's personal attitude; uselessness of "cribs"; higher differentiation of grades that allows detecting completeness of students' knowledge, and not its part when answering tickets; emergence of students' self-education incentive, strengthening their own role in education; easing of emotional tension (the examinee feels less stress than if he or she answers orally); test system allows the higher education institution administration to monitor education process advancing and increases teachers' responsibility for their performance. Certainly, testing as a control method has drawbacks: the student cannot state his thoughts extensively, with complete sentences; testing system of knowledge assessment doesn't make the student think in a complex manner, to separate the main from the secondary; tests results depend on many side factors (health, motivation for result, etc.); time limitation for accomplishing test causes nervousness and prevent some students from keeping their mind on the correct answer, even if they know it; there's possibility of technical error, ill-defined formulation of separate test tasks, potential danger of test base hacking, etc. (Naumenko et al., 2005).

High technologies allow monitoring education process in the form of computer testing carried out for the purpose of independent unbiased information acquisition regarding the level of learners' mastery of subject, conformance of content, level, and quality of training to Federal State Educational Standards of Higher Professional Education (FSES HPE) of the third generation for bachelors and masters under institutional system of education quality control; shaping students' skills regarding working with tests; the use of testing results in the course of interim and final attestation. Within the framework of the project "Internet testing" and "Internet trainers" the technology of Internet exam in the area of professional education is applied in North Eastern State University. These technologies are a software system, in which original techniques of knowledge assessment and goal-oriented training of learners in the course of multiple passing of tests of varying complexity are taken as a basis. Participation in this project allows the higher institution to independently prepare students for external procedures of knowledge quality control (federal Internet examination: competence-based and traditional approaches in the field of professional education); accreditation testing; unscheduled control and supervision procedures), and also carry out internal control of knowledge quality. On the basis of FSES HPE requirements the model of pedagogical measure is represented in three interrelated units. The first unit of tasks examines student's mastery of subject material at the level "to know". This unit includes tasks where method of solution learned by the student during subject studying is obvious. Tasks of the second block assess level of mastery of subject material at the level "to know" and "to be able". This unit includes tasks where there is no explicit guideline for solution and the student himself chooses one of learned methods for its solution. The third unit evaluates mastery of subject at the level "to know", "to be able", and "to master". It's represented by cases, the content of which suggests the use of a complex of skills so that the student could develop the way of solution, combining methods he knows and attracting knowledge from other subjects. In his turn, the student has access to extensive information regarding all test sessions passed as well as possibility to track all testing stages planned for him by teacher. The student logs in using personal number of his grade book.

##### 4.1 Computer Testing

The "Internet trainers in the field of education" system allows conducting testing of students by main subjects of base part of academic departments (federal component subject) of educational programs carried out in the context of FSES HPE of the third generation for bachelors and masters. Internet trainers include theoretical minimum by individual subjects, proper solutions of tasks, pointers to wrong answers, that of practical usefulness when reinforcing knowledge, skills and abilities of students. The "Internet trainers in the field of education" system can be used any time and via any wireless access point. According to a goal set by users, Internet trainers provide different mode of testing for different categories of users (teachers, students, post-graduate students). For example, teaching mode includes testing tasks with not only proper solution variant but also pointers to wrong answers. When the learner passes control testing arranged by the teacher, the system doesn't display rights answers and pointers. At the end of testing the percentage of mastery of test topic sections is detected and opportunity to analyze made mistakes is provided. It should be noted that availability of test trainers on [www.i-exam.ru](http://www.i-exam.ru) is substantial aid for teaching staff when preparing students for testing.

Preparation of tests is very labour-intensive process, which requires high level of professional training: in-depth knowledge of a subject, standards, rules of designing and use of test materials, etc. In the course of attestation not only knowledge, skills and abilities are assessed but level of mastery of sufficiently large set of

general-cultural and professional competences. Current tests are of high validity and indicate probability of forecast of further successful professional activity of higher institutions' students, estimated by means of tests results correlation with assessment of professional activity of graduates collected for 2-3 years of work. Monitoring system is based on the introduction of competence-based tasks into education process. To that end "Provision for Internet examination" in NESU was developed. It defines requirements for monitoring and test materials development by each subject. The notion of competence is usually considered a set of many components, among which competences are distinguished that describe knowledge, skills, abilities, understanding. Generally the notion of competence is wider than idea of learned lessons, skills, abilities, since it does not only includes them but suggests their effective use for solutions of certain area of problems. The following definitions can be found in the works of national and foreign researchers. Competence is knowledge and understanding of how to act in various professional and real-life situations (the TUNING projects—Tuning educational systems in Europe). Competence is based on knowledge, constructed through experience, implemented on the basis of will (John Erpenbeck). Competences are integrated characteristics of person's qualities that allow carrying out activity in keeping with professional and social requirements, and also personal expectations. Competence is body of knowledge, skills, abilities, and work methods necessary for qualitative productive activity upon completion of education (Khutorskoy A. V.). Competence is ability to use knowledge, skills, abilities and personal qualities for successful activity in various professional or real-life case studies; competence is a level of mastery of a set of competences reflecting degree of graduate's preparedness to use knowledge, skills, abilities and competences based on them for successful activity in a particular area (FSES HPE of the third generation). Thus, each of competences of the higher education institutes' student describes quality of achieved results of learning, requires structuring evaluative means for detection of received education quality. Test system together with classic methods of knowledge assessment such as oral enquiry and control works can be used as an instrument for examination of competence learning. This complex approach allows achieving better results monitoring and assessing competence learning. Tests, in their turn, are not confined to factual knowledge, they are added with tasks requiring skill to apply knowledge to new unforeseen situations, skill to generalize knowledge of different subjects, etc. Test tasks focused on abilities development and tasks based on case-studies requiring individual solution have already been used in knowledge evaluation of NESU students.

## 5. Discussion

Computer testing is complex, invariant activity requiring students' goal-oriented training. Like this, when preparing students it's wise to use tests focused on self analysis of learning results—self-reflection. The purpose of self-analysis testing is shaping student's ability to analyze and reasonable assess their cognitive possibilities. Self-reflection test contains questions relating to evaluative judgments of students about their cognitive and other skills (self evaluation ability check, achievements self-analysis—"What I'm able to do? What I need to learn to do?"). Testing for learning results self-analysis involves three stages: task—task setting and completion; answer—ready right answer; reflection—comparison and analysis.

Preparation for testing involves teaching students to self-education method, which allows them to find, digest and reinforce necessary information. Arrangement of solitary work, its managements is important and complicated work of each teacher. Fostering active position and self-dependence should be considered a component in students' training. Solitary work is not an end in itself, but a medium for learners' active position and self-dependence development as personal qualities, development of their intellectual and creative abilities, and competitive ability on the labour market.

### 5.1 Evaluation of Learning Quality

Innovative approach to education in higher institutions provides that research work included in the programs of educational subjects according to new state standards is an integral part of learning process. The teacher offers to students various topics for studies. The beginning is teamwork, when topic is defined by the teacher, but each student contributes to. Subsequently each topic is studied by each student himself. Research work includes the following stages: preparation, planning, study, conclusions, presentation, project results evaluation.

It makes sense to apply high information technologies in teaching: information shells are taken as a basis and new tasks are developed; application and development programs are used: hotlist—making a list of Internet resources by a particular topic (selection of websites, website names, websites' short descriptions), the use of such links saves students' time when preparing to a particular topic; web-quests—placing case studies both in groups and individually (Regional research and practice conference, 2012).

Success in education largely depends on to what extent students' knowledge quality is within the teacher's sight

and what attention is paid to mistakes prevention. All students' knowledge assessment can be useful in the form of small control works, tests. Tests don't substitute scheduled knowledge control, they are not only most saving form of control but also most objective indicator of educational material digestion by students, than data of current, individual check in the traditional form. The results of test are analyzed by teacher, and present, on the one hand, indicator of students' knowledge level, and, on the other hand, self appraisal of the work of the teacher himself that allows him to make corresponding adjustments in the process of teaching and in so doing prevent repetitive mistakes.

## 6. Conclusion

Professional training quality of students in higher education institutions is understood to be final result obtained upon completion of subjects of each curriculum (general-cultural unit, professional unit), which is characterized by a set of specific criteria and indicators. Criteria and indicators of students' professional training quality increase are professional competence, including motivational, cognitive and activity components, student's professional self-esteem (for example, in the course of education the student forms his professional portfolio where he reflects his individual achievements as a future master of his craft), quality and speed of tests solution. It's typical for facilities of student's professional training quality increase, as distinct from traditional training methods, introduction of new forms and methods of students' performance assessment such as case methods, portfolio, case histories, pedagogical tasks, modular control, pedagogical testing. Testing technology provides step-by-step development of student's competences integral formation indicated in FSES HPE of the third generation. Testing in point-rating system instead of five-mark grading system involves evaluating learners' professional training quality criteria (criterion component) as well as methods of adjustment of educational activities of each student focused on assured achievement of education goals. Organization of pedagogical testing also involves person-oriented interaction with students, pedagogical support, which is distinct for high level of common understanding and time savings.

It is necessary to point out the systematic and planned use of testing technology in higher institutions' educational process as monitoring facilities and students' training quality assessment is suggested for the purpose of student's professional training quality increase by means of pedagogical testing. Providing motivation students' positive motivation towards pedagogical testing will also influence preparation and education results.

Enhancement of monitoring is one of the most relevant topics regarding education issues. Testing as one of monitoring forms should be on an equal basis with traditional solitary and control works. Combination of all kinds of control allows the teacher to complement education process in a more qualitative manner. In our opinion, testing is one of effective instruments for education quality increase both at the higher institution level and at the level of Russian education system. Conclusions and proposals stated in the study do not lay claims to final exhaustive solution of the matter. Further study of testing technology will be related to features of pedagogical control use in educational process of the higher education institution.

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