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NEWS

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OF THE REPUBLIC OF KAZAKHSTAN

**ХИМИЯ ЖӘНЕ ТЕХНОЛОГИЯ
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**INTENSIFICATION OF TRAINING
IN CHEMICAL DISCIPLINES OF SPECIALIZATION
IN THE CONDITIONS OF CREDIT SYSTEM OF EDUCATION**

Abstract. Kazakhstan is the first state in Central Asia which entered terms of Bologna Process and being the participant of the European space of the higher education. By now Kazakhstan educational programs in universities shifted to the credit system and brought into line with the International Standard Classification of Education. The article describes test system as a way to intensify the cognitive activity of students in the chemical specialties of universities. The authors prove the need for regular use of the tests as a method that encourages students to be always prepared for classes. The growing informatization of society results in need of changes in the organization of educational process, directed to a tutoring process intensification. For the solution of such tasks in the considerable degree it is promoted by use of test monitoring of students. The test allows the teacher with the minimum expenses of time to objectively assess the knowledge of the entire contingent of students. Properly set up the test task makes it possible to obtain the necessary information about the degree of assimilation and mastering of the essence of chemical processes and phenomena by students. The positive aspects of using testing systems also include: saving most of the classes for the study of new material, the ability to test the knowledge of students in the group, rather than individual students, accustoming the students to understand the need to prepare for each lesson, the mobilization of the mental abilities of students.

Key words: chemistry, teaching technique, credit technology, testing

Introduction

In accordance with the provisions of the Lisbon Convention (1997) and the Bologna Declaration (1999) in Kazakhstan universities since the early 2000s, it was introduced the credit system of education. The need to go to the credit system of education was associated with the integration of the national education system of Kazakhstan into the world educational space, as well as the need to create the necessary conditions to meet the graduation diplomas of students who graduated from higher educational institutions of the Republic of Kazakhstan the requirements of the international community and the possibility of their employment abroad [1-3]. The credit technology is the educational technology leading to increase in level of self-education and creative development of knowledge on the basis of individualization, a possibility of the choice of the studied disciplines within a rigorous regulation of educational process and the accounting of volume of knowledge in type of loan. On this system the organization of tutoring with reorientation of students to more self-contained, active mastering system of knowledge, skills, to accumulation of creative experience, development of their educational cognitive activity, professional and cognitive requirements and interests is carried out [4, 5].

In compliance with requirements of time, a global computerization strengthening of "an education intensification" is necessary. The task of assimilation of necessary knowledge and abilities in a stream of a huge number of information which during a short time term quickly becomes outdated is set for today's student. Yu.K.Babansky under "an education intensification" represented "increase in labor productivity of the teacher and a pupil in each unit of time" [6, 7].

S.I.Arkhangel'sky this term defined as "upgrading of tutoring and simultaneous decrease in time expenditure" [7, 8]. The purposes of an intensification should be intense, focused on a maximum of opportunities of students and thus should cause high activity and to be accessible, actual; as the overestimated purposes lead to "self-disconnection" from the solution of objectives; they should be changing with change of conditions and opportunities for their achievement. H.Ebli emphasized that tutoring requires energy release and motivations" [9]. Success of tutoring is defined by three major factors: mental abilities, its motivation regarding training objectives, techniques of training and work (teaching methods).

The teacher who created system of learning on discipline can guarantee to students the planned on it result. The learning tools cannot change over time, however tendencies of development of society leave a mark on their choice and use by the teacher.

In the modern conditions for increase in level of tutoring of the students studying chemical specialties there are various methods of an intensification mobilizing abilities of students [10-12]. Cases when a particular part of yesterday's school students, coming after a school bench to chemical faculty with good (or excellent) estimates, honestly learning material are quite frequent, cannot comprehend and understand these or those events after retelling of material. Some part of students at answers to questions has problems just with judgment of the composite chemical concepts, and they are limited to routine retelling of material without explanation of subtleties of the chemical phenomenon. In the classical model of lessons only a part of the students can be queried (especially if the number of groups of students is large enough). For this reason, some students understand that if they were interviewed in today's lesson, then the turn to be interviewed will approach them only through 2-3 lessons. So it is possible to come to lessons unprepared. For elimination of this shortcoming the testing method which intensifies ideational activity of students may be used. Certainly, this method is not ideal and is not indisputable, but in it there is a lot of positive. Only a very conscientious student will learn the material for each lesson in full, and most of the group of students is only slightly acquainted with a given at home.

Essence of test system and its application

The test system teaches students to think about the need to prepare for each lesson a training material. The most important difference from the usual test task - its processability. This means that the task has a clear and unequivocal and answer is evaluated as standard.

Using the test method in teaching students and pupils is not a new method of teaching. In the literature, many references about the use of the test system since ancient times [13-16]. It is impossible to restore the complete and precise history of tests and testing. In ancient Babylon tests of graduates at schools of professional copyists were carried out. In ancient Egypt the system of tests for interviews and the subsequent check of abilities was used. In England the written works for increase in motivation of study were for the first time used.

The ancestor of testing is often called the English scientist Francis Galton who in 1884-1885 carried out a row of testing for visitors of the laboratory [17]. In the USA the first book with the test tasks in mathematics, history, grammar, navigation, the texts for essay, with using simple statistical calculations in the pedagogical work appeared. In Germany examinations with the commission not less, than from two people were held oral (unlike traditional English written). In France there were the first attempts of testing of mental abilities of children by specially created tests for intellectuality check.

The first tests on the territories of imperial Russia appeared at the beginning of the 20th century and were used as auxiliary tools of checking of knowledge. In the USSR along with auxiliary use of tests and testings there were available also attempts of rejection and even the ban of testing. For example, in 1936 the Resolution of Council of People's Commissars "About pedagogical perversions in system Narkompross" was accepted [18].

All this has resulted to stagnation in the development of tests for the period from mid-30s to late 70s. At the source of modern testology were representatives of American and European schools of psychology of the nineteenth and twentieth centuries: Binet, Wechsler, Guilford. The modern testing is reckoned usually from the tests developed A.Binet and T.Simon by request of the Ministry of Public Education of France for selection in special schools of children with a delay of intellectual development. There has been an increased growth of interest to tests and testing in many countries in order to maintain a

certain, though often the minimum, state-level general education. For example, in the US, Germany, France, Australia and other countries.

In Kazakhstan there was for a number of years the Uniform National Testing, as well as the Unified state examination in Russia since 2000.

So the test is a system of short questions and tasks, with restriction of a run time for establishment of characteristics of training and their subsequent analysis. The test consists of test tasks. Test task – an educational situation for which student (pupil) should choose possible answer or design such option.

In practice when teaching chemical specialties at the greatest distribution was gained by the following forms of test tasks [17-19] :

1. Closed test tasks: alternatives; double alternatives; graduation; compatibility or chain; cumulation (accumulation)

In the task it can be identified major part of the approval, containing the statement of the problem, and ready-made answers, formulated by the teacher. Among the answers a correct answer is usually only one, but does not exclude other options. The number of wrong answers determined by the reference view, usually not more than five.

In addition to general there are some more requirements to tasks of the closed form:

- in the text of a task any ambiguity or an ambiguity of formulations should be eliminated;
- it is necessary to include as much as possible words in the main part of a task, leaving for the answer no more than two-three the most important, keywords for this problem.

Tasks of the closed form have both advantages, and shortcomings. Their advantages are associated with the speed of testing and with simplicity of calculation of points. Among shortcomings usually note effect of guessing, the characteristic of poorly prepared students at answers to the most difficult test questions. Tasks of the closed form are followed by the instruction: "Lead round number of the correct answer". In case of computer delivery of tasks use the instruction: "Dial number of the correct answer".

2. The open test tasks

At the answer to an open task the student finishes the missed word, a formula or number on the place of a dash. The task is formed so that demands definite and the unambiguous answer and does not allow double interpretation. In case it is possible, after a dash the units of measure are specified. A dash is put in place of the key term, knowledge of which is essential for controlled material. All dashes in open tasks for one test is recommended to do the same length. In the course of development of a task it is necessary to simplify the complicated syntactic designs.

For a task of an open form it is recommended to use the instruction consisting of one word: "Add".

3. The tasks on compliance

In these tasks the teacher checks knowledge of communications between elements of two sets.

At the left elements of this set, on the right - the elements which are subject to the choice are usually given. The number of elements of the second set can exceed number of data.

To tasks the reference instruction consisting of two words is offered: "Establish compliance". As in tasks of the closed type, the greatest difficulty in the design associated with the selection of plausible redundant elements in the second set. The effectiveness of the task will be significantly reduced, if implausible elements are easily distinguished by students.

4. The task to establish the correct sequence.

Tests of the fourth form are designed to estimate the level of knowledge of a sequence of actions, processes, calculations, etc. In the task are provided in arbitrary random sequence actions or processes associated with a particular task. The student must set the correct order of the proposed actions and indicate it with the figures in specially allocated places.

Standard Instruction for tasks of the fourth form is "Set the correct sequence." Tasks for establishment of the correct sequence of actions have particular advantages when developing complex tests because they are convenient for assessment of professional standard of students, directly bound to their future activity.

At the choice of a form of a test task it is necessary to remember that to each discipline own unique content, different from other disciplines is inherent. Therefore is not present and there cannot be uniform recommendations for the right choice of a form.

Process of test measurements is extremely standardized:

- all instructions to one form are given by the same words;
- in advance developed system of calculation of points is applied to all examinees to students equally;
- all examinees answer on tasks of identical complexity.

To exclude a possibility of cheating, exam tip (prompt) and other violations, in tasks it is necessary to enter variable parameters which change in tolerance limits provides multivariate of each test question. At the same time all students of group perform the same tasks, but with different values of parameter and, respectively, with different answers. Thus, two problems are solved at the same time: the possibility of cheating (copying) is eliminated and a parallelism of the variants of tasks offered to various students is provided. Tasks in the open form with variable parameter are especially effective at computer control when values of parameter are chosen in a casual order. Therefore at developing computer version of the test these tasks should give preference though the final decision of a question of the choice of a form depends on the maintenance of a controlled subject.

So, let's review some examples of test tasks for students on chemical specialties (Table).

Table - Approximate tasks for test monitoring on chemical specialties (with the different complexity of the questions)

| # | Questions | Correct answer |
|----|--|---|
| 1 | Which of the following is not a chemical element? a) nitrogen, b) helium, c) boron, d) tar | d) tar |
| 2 | In which reaction cannot enter saturated hydrocarbons? a) hydrogenation, b) dehydrogenation, c) cracking, d) oxydation | a) hydrogenation |
| 3 | What is the IUPAC name for $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$? a) propane, b) propanol, c) ethanol, d) propenol | b) propanol |
| 4 | What is the chemical formula of sodium carbonate? a) NaCO_3 , b) Na_2CO_3 , c) $\text{Na}(\text{CO}_3)_2$, d) NaNO_3 | b) Na_2CO_3 |
| 5 | In the list of substances: A) $\text{C}_6\text{H}_{14}\text{O}$, B) $\text{C}_5\text{H}_{10}\text{O}$, C) $\text{C}_3\text{H}_8\text{O}$, D) $\text{C}_2\text{H}_4\text{O}$, E) $\text{C}_4\text{H}_{10}\text{O}$, F) $\text{C}_4\text{H}_8\text{O}$ to saturated alcohols include: a) A, F b) B, D, F c) A, D, E d) A, C, E | d) A, C, E |
| 6 | Which list relates to solid fuels? a) coal, brown coal, combustible slates (shales), peat, wood; b) coal, plastics, acid, wood, brown coal; c) wood, soil, peat, brown coal, tar; d) brown coal, peat, amber, tar, coal. | a) coal, brown coal, combustible slates (shales), peat, wood |
| 7 | How many countries were included into OPEC at the beginning of the creation of the organization? a) 7, b) 6, c) 5, d) 9 | c) 5 |
| 8 | How it's correct to show the stages of coal formation: a) 1) Peat → 2) → Lignite 3) Coal → 4) Anthracite b) 1) Peat → 2) → shale(slate) 3) Coal → 4) boghead (torbanite) c) 1) Peat → 2) → Lignite 3) Coal → 4) bitumen d) 1) Peat → 2) → Lignite 3) shale (slate) → 4) Tar | a) 1) Peat → 2) → Lignite 3) Coal → 4) Anthracite |
| 9 | What process is not the process of the secondary processing of oil? a) alkylation, b) catalytic cracking, c) distillation, d) hydrotreating | c) distillation |
| 10 | The technological principle of "fluidized bed" is used in the production of: a) ammonia; b) methanol; c) sulfuric acid; d) aluminum. | c) sulfuric acid |

Conclusion

Thus the positive aspects of using testing systems are the ability to test the knowledge of all students in the group, accustoming the students to understand the need to prepare for each lesson, the mobilization of the mental abilities of students. Despite the seeming simplicity the test questions also

check attentiveness. After estimation of results of testing it is necessary to carry out a lesson for an explanation of results of answers. It is possible to involve in a discussion of students, who the best of all answered the tasks. It is known that the tested tasks used in some countries and some companies of the CIS countries, not only in training but also in the interview when applying for a job. Perhaps, in the long term test method may be useful for students and in their future professional activity. Therefore, testing the use undoubtedly will be more useful in training on chemical specialties.

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НЕСИЕЛІК ЖҮЙЕ ЖАҒДАЙЫНДА ОҚЫТУДАҒЫ МАМАНДАДЫРУДЫҢ ХИМИЯЛЫҚ ПӘНДЕРІН ҮЙРЕТУДІ ҚАРҚЫНДАНДЫРУ

Аннотация. Қазақстан – Болон процесінің мүшесі болатын және Еуропа кеңістігіндегі жоғарғы білім беру қатысушысы болған, Орталық Азия елдерінің алғашқысы болып табылады. Қазіргі уақытта қазақстандық жоғарғы оқу орындарының білім беру бағдарламалары несиелі жүйелерге көшкен және де білім берудің Халықаралық стандартты классификациясына сәйкесінше ауыстырылған. Мақала жоғарғы оқу орындарында химия мамандығы бойынша оқитын студенттерді тестілеу жүйесін, студенттердің танымдық қызметін қарқындыру әдістерінің бірі ретінде суреттеп отыр. Авторлар тестілеуді уақытылы қолдану қажеттілігі, студенттердің әрдайым сабаққа дайындығын күшейтетіндігін негізге алып отыр. Қоғамда өсіп келе жатқан ақпараттандыру, білім беру процесін қарқындыруға бағытталған оқу процесін ұйымдастыруда өзгерістер енгізу қажеттілігін туғызады. Бұған химия пәні бойынша мамандандыру жүйесіндегі студенттерді тестілі бақылау елеулі деңгейде мүмкіндік береді. Тестілеу арқылы студенттердің барлық контингентінің білімін, мұғалімнің уақытын көп кетірмей ақ әділетті бағалауға болады. Тестілік тапсырмаларды дұрыс жасау студенттердің химиялық процестер мен құбылыстарды қаншалықты игергендіктері жөнінде қажетті мәліметтерді алуға мүмкіндік береді. Тестілеу жүйесін қолдануда жағымды жақтарына мыналар да жатады: жаңа материалды зерделеуде сабақтың көп бөлігі үнемделеді, топтағы жеке емес барлық студенттердің білімдерін тексеруге мүмкіндік бар, студенттерді әр бір сабаққа дайындалу қажеттігіне үйрету, студенттердің ақыл – ой қабылеттерін жұмылдыру.

Түйін сөздері: химия, сабақ беру методикасы, несиелі технологиясы, тестілеу.

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ИНТЕНСИФИКАЦИЯ ОБУЧЕНИЯ ХИМИЧЕСКИМ ДИСЦИПЛИНАМ СПЕЦИАЛИЗАЦИИ В УСЛОВИЯХ КРЕДИТНОЙ СИСТЕМЫ ОБУЧЕНИЯ

Аннотация. Казахстан - это первое государство в Центральной Азии, вступившее в члены Болонского процесса и являющееся участником Европейского пространства высшего образования. К настоящему времени казахстанские образовательные программы в вузах перешли на кредитную систему и приведены в соответствие с Международной стандартной классификацией образования. Статья описывает систему тестирования как один из способов интенсификации познавательной деятельности студентов, обучающихся на химических специальностях вузов. Авторы обосновывают необходимость регулярного использования тестирования как один из методов, который побуждает студентов быть всегда подготовленными к занятиям. Растущая информатизация общества приводит к необходимости изменений в организации учебного процесса, направленных на интенсификацию процесса обучения. Этому способствует в значительной степени при изучении химических дисциплин специализации система тестового контроля студентов. Тест позволяет с минимальными затратами времени преподавателя объективно оценить знания всего контингента студентов. Правильно созданное тестовое задание дает возможность получить необходимые сведения о степени усвоения сути химических процессов и явлений студентами. К положительным моментам использования системы тестирования также относятся: экономия большей части занятия для изучения нового материала, возможность проверки знаний всех студентов в группе, а не отдельных студентов, приучение студентов к пониманию необходимости готовиться к каждому уроку, мобилизация умственных способностей студентов.

Ключевые слова: химия, методика преподавания, кредитная технология, тестирование.

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