ТЕОРІЯ І МЕТОДОЛОГІЯ НЕПЕРЕРВНОЇ ПРОФЕСІЙНОЇ ОСВІТИ

THEORY AND METODOLOGY OF CONTINUING PROFESSIONAL EDUCATION

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ASSESSMENT MODEL OF HIGH SCHOOL STUDENTS' PERFORMANCE: EXPERIENCE OF UKRAINE

The article considers modern approaches to assessment at schools based on the analysis of various assessment scales (range from three to one hundred points).

The pedagogical regularities influencing the choice of assessment scales are determined, in particular: 1) increase of quantitative parameters of the assessment scale; 2) the use of a tribal rating scale for one-element answers; 3) the use of indirect evaluation with a significant amount of evaluation scale; 4) application of mathematical methods of transition from qualitative parameters to quantitative indicators of estimation; 5) taking into account the level of structure of the subject and the relationship between learning and development of subjects of study. Finally, we propose three secondary school testing and evaluation systems models that provide mathematical, humanities and general education.

To identify the causal effects from different assessment scales, we conduct an educational experiment and a large-scale online survey in Ukrainian schools from 2019-2021. As a result of experimental research, we allocate the essential elements of testing and estimation activity: educational parameters, the structure of components of knowledge of a subject, criteria, a scale of estimations, an interval scale of transition to assessments, forms of final and local testing. The findings suggest that the developed approaches to assessing high school students' educational achievements are more effective than traditional ones. They encourage schoolchildren motivation to learn, in particular, in performing independent (especially homework) tasks. The obtained data confirm the need to use new approaches to assessing student achievement.

Keywords: ***educational achievements; high school; high school students; modular assessment; pedagogical model.***

Introduction. The concern for assessing learning outcomes is reinforced by the requirement expressed by society to get hold of skills graduates in various fields of activity. In this context, new questions arise (Lile, 2014, p. 125).

Ukrainian higher education institutions, integrating into the single European educational space, are introducing credit-module learning technology. It would be logical to prepare high school students for the perception of new educational technologies. With the provision of sequent credit transfer technology, there is a need to introduce an active search for modular approaches to teaching high school students. Assessment at schools is a multipurpose tool that aims to improve and assure educational quality (Borch, 2020, p. 83). However, teachers use assessment differently (OPU). Each teacher evaluates students according to the school charter (Ocenianie).

The study of theoretical principles, analysis and systematisation of different approaches to the organisation of modular learning showed that at the present stage, in a twelve-point grading system, it is essential to propose, justify and explore the effectiveness of new approaches to assessing high school achievement. Since modular learning aims to encourage students to systematically and systematically organise learning work, one of such motives will be a well-organised evaluation of students' learning outcomes. School assessment plays a significant role in the teaching process, both in the didactic and upbringing sense. Accurately issued assessment should fully reflect the capabilities and efforts of the student, as it is a summary of some part of his work (OSPNW).

Literature review. Modular learning technologies are not new to the Ukrainian education system. Their effectiveness and efficiency have been substantiated for higher education institutions and covered in pedagogical science by Ukrainian researchers (Korsak, 2003; Khurlo, 2003; Boichenko et al., 2020). Module development technology is a prominent place among school module learning technologies (Sikorsky, 1997; Mukhametzyanova et al., 2001; Bytsyura, 2002; Parinova and Grishina, 2003; Bilyakovska, 2008). Scientists point out various approaches to assessment learning outputs. For example, Shepard (2019) studies classroom assessment to support teaching and learning. Abramtsov (2018, p. 16) states about the importance to take into account the concept of Sartre about the psychology of emotions while students' results assessment (p. 16). Syaifuddin (2020) investigates the implementation of authentic assessment among young high school teachers. The factors that support successful students at industrial-grade lyceums are revealed by Wirawan et al. (2020). Abdallah (2021) studies predicting student performance using data analysis methods, as well as teaching analytics.

The research reveal**s** adaptive-modular testing and evaluation systems' effectiveness based on the experimental testing of high school students' learning outcomes.

Research methods. We used theoretical and empirical research methods to solve the set tasks: theoretical – literature review of psychological and pedagogical resourses made it possible to identify the current issues of testing and evaluation of student's academic achievements; didactic principles for creating modular testing and evaluation systems; empirical – pedagogical observation, questionnaires and surveys, interviews. The pedagogical experiment aimed at testing the effectiveness of assessment model approaches for different classes in modular learning. We used methods of mathematical statistics for qualitative and quantitative data analysis.

The primary empirical research method is a pedagogical experiment that includes the organisation and conduction of a research experiment. Other empirical methods preceded the research experiment:

• diagnostic (the scientific literature study on the research issue);

• prognostic (observations, surveys of students and teachers);

• confirmation (a pedagogical experience generalisation and analysis of own experience).

We conducted appropriate observations, interviews, lesson analysis, and approaches to assessing student achievement in schools to verify the effectiveness of empirical data.

The experimental base of research. The research was carried out in Ukrainian secondary schools in Kyiv, Lviv and Khmelnytsky. The participants of the educational experiment and survey respondents were 366 students and 92 teachers.

Results of the research.

Modular assessment module of students' academic achievements. The problem of the modernisation of testing and evaluation remains relevant in the educational environment. After all, we all strive for fairness in assessment, equal access to education, obtaining maximum scores for a job well done. That is why judgment is an essential part of the learning process.

Monitoring and evaluation are integral components of any educational technology. They include the following main elements: academic parameters, the structure of knowledge components of the subject, criteria, scale of assessments (numerical or alphanumeric), interval scale (in terms of indirect assessment), forms of final and local testing.

Training parameters – are different learning outcomes (theoretical and practical components) and diverse student learning types (attending lessons, doing homework, preparing for and participating in competitions and conferences). They are the essential elements of the testing and evaluation system. Depending on the target settings in the study of the subject in the assessment system, teachers can enter various learning parameters. However, their choice and share in the final assessment must meet specific pedagogical requirements, namely:

• the number of learning parameters should be feasible for implementation for both students and teachers;

• depending on the distribution of target settings (from acquaintance to complete mastering or vice versa), the role and significance of the theoretical or practical component of the subject change differentiated into reproductive and creative parts. Furthermore, this affects the quantitative and qualitative choice of educational parameters. Besides, if the subject is mainly familiar, then the role of motivational learning parameters and their share in determining the assessment (attendance, homework, and essays);

• the percentage of selected educational parameters in the final evaluation is substantiated and agreed with other testing and evaluation system elements, educational technology in general.

The choice of learning parameters and their significant impact on student learning and final assessment indicate the assessment system's effectiveness.

No less critical in the testing and evaluation system is the structure of the subject's knowledge components. It determines the educational parameters' inner essence: theoretical and practical features. Theoretical knowledge components include terms, concepts, properties, laws, patterns, events, phenomena, practical skills, abilities, and abilities (solve problems, set experiments). While facilitating the memorisation and assimilating the knowledge, it is necessary to establish logical relationships between them, identify the main ones, and determine their psychological features (learning structuring). According to Bilyakovska (2008), knowledge is structured and consists of interrelated elements.

The problem of structured and generalised knowledge selection by students for complete mastering is practically not investigated. As a result, each teacher primarily learns textbook knowledge with students, but remembering many facts is almost impossible. That way of learning leads to isolated and unsystematic experiences. Therefore, such training results are knowledge instability, overlapping, confusion, and even lack knowledge transfer (Bilyakovska, 2008). The consequence of such approaches to learning is that more and more students stop learning altogether and finish school without basic knowledge in the basics scientific fields every year. While determining the subject learning components for a particular class, it is necessary to differentiate the knowledge and practical skills needed for complete mastery and just getting acquainted. The final test should include only knowledge and skills required to complete mastery, but thematic or Module tests should check only quickly mastered knowledge. Tests should not combine learning material of non-importance for students.

When determining the subject's knowledge components, it is necessary to decide its priority (theoretical or practical). Increasing the academic level of educational material leads to an increase in mental abilities. However, in the conditions of professionally-focused high school, the maintenance and structure of science are changing. Therefore, students' development can be accelerated by choosing educational material and analytical skills development of independent work (Bilyakovska, 2008). For example, evaluating science is theoretically focused, but foreign languages assessment (communicative skills) is practice-based.

Therefore, to form the structure of the knowledge components of the subject, teachers need to solve the following psychological and pedagogical problems:

• structuring of educational material (elements selection of knowledge and skills and establishment of interrelations between them);

• the knowledge generalisation for complete mastering);

• prioritisation of theoretical or practical components.

Following the formation of the structure of the subject knowledge components, the evaluation criteria are determined. Despite different student abilities, traditional teaching uses the same measures for all learners. Teachers do not feel the need to individualise the process of evaluation and construction of subject relations. Assessment becomes a goal for students, not a means of education (Khurlo, 2003). In modular learning, for example, in the indirect evaluation, theoretical elements of knowledge are selected. Moreover, according to their share, each aspect and practical task are assigned some points in the integrated assessment. Based on these data, tests, tests, exam cards are compiled. The direct evaluation focuses on gaining the specific knowledge and skills to obtain an assessment.

In both cases, it is necessary to determine the core of knowledge and design its appropriate assessment. Besides, paying attention to quantitative criteria will promote learners' effective use and learners' intellectual potential. Moreover, since the evaluation criteria of any process are a guiding element, their proper use will help stimulate, improve and intensify the process. The main requirements are objectivity, efficiency, reliability, and high credibility (Bilyakovska, 2008).

Despite all positive grades on the Ukrainian 12-point rating scale, the primary evaluation for knowledge core can be «6». Determining the knowledge core requires a teacher to a sufficient pedagogical experience (Bilyakovska, 2008). Depending on students' intellectual capabilities, the knowledge core may expand for different typological groups, but its minimum value remains constant.

A prominent place among the evaluation system elements takes the forms of a local and final assessment, e.g. examination, modular, and thematic tests.

In Ukraine, the examination form of the final assessment is used only in graduating classes and from a limited number of subjects. The other subjects final assessment is conducted based on thematic judgment (arithmetic mean, visual estimate, taking into account the importance of topics).

The assessment system does not sufficiently meet modular learning characteristics, expanding students' independent educational and cognitive activities. The rating system meets the following requirements: 1) the ability to choose and independently plan educational activities; 2) 12-point rating scale, improved by additional indicators of points and coefficients; 3) the possibility of applying the minimum number of educational activities performed by a student for a certain period; 4) maximum coverage of educational material at any stage of knowledge testing; 5) automation of student performance accounting using computer technology; 6) monitoring of the current and final rating of student performance (Bytsyura, 2002, p. 24).

Module learning technologies are also developed for high school. Their introduction will increase the productivity of high school students, teach them to daily mental work, promote the most effective preparation for participation in independent tests, and ensure the education technologies in schools (Bilyakovska, 2008).

Higher education successful outcome largely depends on what knowledge, skills, and the ability to learn the school has equipped its graduates. After all, schools, programs, teaching and assessment methods should consider creating conditions for identifying students' activity (Bilyakovska, 2008). Practice shows that difficulties often accompany school students' transition from the classroom system to mostly independent university classes. First-year students' inability to rearrange educational activities following the new conditions may cause dissatisfaction and a negative attitude towards learning. On the other hand, students are involved in interactive and practical learning activities at module learning. There is an individualisation of testing, self-testing, correction, counselling, the degree of independence. Noteworthy is that students have the opportunity to realise themselves, to motivate learning. This education model guarantees students the development of education standards and promotion to a higher level of education.

Module learning technology and its subsystem – modular assessment with rating indicators create conditions for the non-examination objective of learning outcomes, i.e. high school graduates can be enrolled in universities on rating indicators without entrance, including independent tests. In addition, the rating system allows to determine the student training level; to differentiate the significance of assessments obtained for various activities (independent work, modular, final test, training, and homework); to reflect the current and final evaluation; to create conditions for fair competition among students (Parinova & Grishina, 2003, p. 94).

Another form of final assessment can be invaluable. A criterion-oriented assessment approach provides a dichotomous «pass/fail» scale in a module test. This judgment is made based on an integrated evaluation; in particular, it may be a test (Mukhametzyanova et al., 2001, p. 49). For example, in profile classes, non-core subjects are studied with dominant introductory goals so that the final record can be «pass/fail».

Progress testing (after studying the topic, Module) should be various (written and oral tests) to consider individual characteristics, attitudes to the subject, and prior knowledge level. This differentiated approach encourages students to understand the principles and transparent evaluation criteria, their motivation and the perception of a more transparent system of improving the knowledge quality (Bilyakovska, 2008, p. 28). The use of one form of testing creates conditions for students to find non-didactic methods of their compilation. Besides, it impoverishes the learning process, its development opportunities.

Another essential element of evaluation is the assessment scale. Both quantitative and ordinal grading scales are standard in school practice. If the set is a numerical set, then the assessment is on a quantitative scale – this method is the most common. A quantitative scale can be absolute (count does not depend on the object) and relative (count depends on the object) (Fig. 1).

An ordinal assessment scale focuses on diagnosing students' knowledge and skills in the same conditions. Thus, the measurement of objects among themselves and their location in order from highest to lowest. Ordinal scales can be descriptive (descriptive) and rank (Bilyakovska, 2008).

It is a mistake to think that a mechanical increase in the assessment scale will significantly improve educational efficiency. The evaluation scale's scope determines the type of testing and evaluation – direct or indirect.

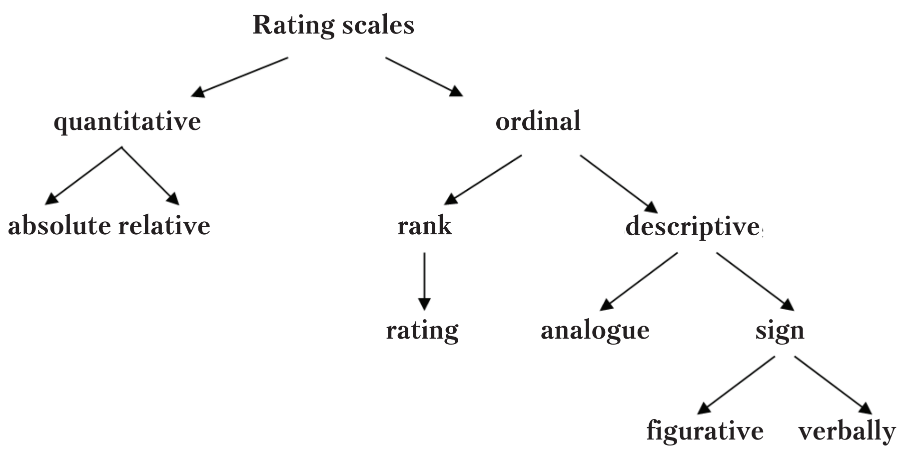

Figure 1. **Types of rating scales**

Developed by the authors

The transition from direct to indirect system is necessary if the scale is more significant than six. This is because a direct evaluation on a large scale cannot be objective. After all, the more extensive the scale, the less objective is the evaluation. In addition, due to a large scale, it is impossible to unambiguously define each grade's evaluation criteria to ensure a direct assessment.

The 12-point scale has significant disadvantages. First, an even number of points causes a dispute over the 'average score'. It is also essential that, given the qualitative measurement of many pupils or students, the histogram of grades is the symmetrical single-vertex Gaussian distribution curve. The number of points should be odd (1–5 or 0–10) and has one of them in the middle of the scale (respectively, 3 and 5) (Korsak, 2003, p. 3). Second, to conduct an objectively direct assessment, teachers and students should be aware of the assessment criteria. That makes that procedure hard to perform as the scale increases. Third, any education level should have its assessment scale scope that corresponds to students' age and psychological characteristics and is perceived by them adequately. Only a pedagogically thought-out and substantiated assessment scale will ensure a smooth transition from formal, formative (verbal) (grades 1, 2) to formative and final assessment (grades 3, 4 – tribal scale: «initial (D)», «intermediate (C)», «sufficient (B)», «high (A)» grades 5–11 – 12-point: «1–12»), as well as – from direct to indirect assessment.

The essence of indirect assessment is that a grade does not assess the results of all forms of testing. Instead, they are assigned a certain number of points depending on the significance of the training material covered (Sikorsky, 2004, p. 383).

An indirect assessment requires matching *performance tasks* with the knowledge core and with its grade. For example, in a Maths class, the knowledge core includes theoretical knowledge – 25%, practical skills – 20%, homework – 10%. Total – 55%, then in the interval scale, the score «6» corresponds to 51–60%.

The interval scale of the transition from the received points to estimation is based on the following pedagogical requirements. Thus, a student earns a grade of «12» if he scores 100% for *performance tasks.*

A student scores more than 100% when participating in scientific conferences and competitions. For example, the interval scale may look like this:

«1» – 0 –10%	«7» – 61–70%
«2» – 11–20%	«8» – 71–80%
«3» – 21–30%	«9» – 81–90%
«4» – 31–40%	«10» – 91–95%
«5» – 41–50%	«11» – 96–100%
«6» – 51–60%	«12» – 100% or more.

This interval scale has certain regularities:

• before «10», the interval is 9, and the first digit of the second interval coincides with the grade (all the other intervals are equal 10);

• for «10» and «11», the interval is four, the second interval equals 5.

Using the above considerations, we model an evaluation technique in mathematics for high school.

Ø **Natural and mathematical direction**

Model A: indirect-modular-cognitive

1. Training parameters and the relationship between them:

a) theoretical components – 25%;

b) practical reproductive skills – 20%;

c) creative, practical skills – 35%;

d) homework and the state of keeping notebooks – 20%.

2. The structure of knowledge components:

a) concepts, their properties (theorems, formulas);

b) single practical skills, i.e. performing mathematical operations, solving the simplest equations, inequalities and calculating;

c) creative, practical skills, i.e. solving more complex exercises and tasks.

d) algorithms for performing mathematical operations, solving equations and inequalities (systems).

3. Evaluation criteria: indirect-modular assessment; the number of points per Module is equal to 100; they are distributed between educational parameters as follows: test in theory (test) – 25 points, test work № 1 (skill level) – 20 points, test work № 2 (creative level) – 35 points, for homework – 20 points. The knowledge core consists of certain theoretical elements – 25 points, test № 1 (skill level) – 20 points, homework – 10 points. The module test assesses only the theoretical knowledge and practical skills needed for complete mastering. It includes the knowledge and skills from the previous modules as well.

4. Rating indicator for the semester (year) is defined as the percentage of the sum of points for performance tasks for the semester (year) to the maximum possible amount; the number of points for each test task is determined by the assessed subject; the rating indicator depends on the students' participation in the contests; students can perform creative work (articles, essays, etc.) and receive additional points; students self-assess their learning participation (learning the theory, doing homework, etc.); if a student misses classes for valid reasons, he is given the right to finalise the learning material independently or with the help of the teacher and eliminate the debt; reference assessment is performed only once; if a student without good reason does not receive a grade (fail the test), then he is given zero points; a student is obliged to finalise the learning material of the Module and confirm its mastering during the next Module; students missed classes due to illness can do module tests.

Interval transition scale from rating indicators (%) to grades:

«12» (100% and more), «11» (96–100), «10» (91–95), «9» (81–90), «8» (71–80), «7» 61–70), «6» (51–60), «5» (41–50), «4» (31–40), «3» (21–30), «2» (11–20), «1» (0–10).

6. Rating scale: 12-point.

7. Interval transition scale to grades:

«1» – 0–10%	«7» – 61–70%
«2» – 11–20%	«8» – 71–80%
«3» – 21–30%	«9» – 81–90%
«4» – 31–40%	«10» – 91–95%
«5» – 41–50%	«11» – 96–100%
«6» – 51–60%	«12» – 100% or more.

8. Progress testing:

a) theoretical components – test;

b) practical reproductive skills – written test № 1;

c) creative, practical skills – written test № 2.

9. Final achievement testing – module test. The rating indicator's final score is determined (the percentage of the sum of points from all modules to the maximum possible) and translated into a score on a rating interval scale.

Ø **Socio-humanitarian direction**

Model B: indirect-modular-motivational

1. Training parameters and the relationship between them:

a) attending lessons – 20%;

b) practical reproductive actions – 60%;

c) homework and the state of keeping notebooks – 20%.

2. The structure of knowledge components:

a) algorithms for performing mathematical operations, solving equations and inequalities;

b) single practical actions (skills): performing mathematical operations, solving equations, inequalities, calculating.

3. Evaluation criteria: indirect-modular assessment; 1 point is awarded for each class attended and 1 point for homework completed; the total number of points is defined as a number by its percentage (for example, the Module has 10 lessons, then 10: 0.2 = 50 points, i.e. for attending classes – 10 points, for homework – 10 points and for testing work (reproductive) – 30 points); the rating indicator for the semester (year) is a percentage of the sum of points of educational parameters for the semester (year) to the maximum possible amount.

4. Rating scale: 12-point.

5. Interval scale of transition to assessment:

«1» – 0–12%	«7» – 53–60%
«2» – 13–20%	«8» – 61–68%
«3» – 21–28%	«9» – 69–76%
«4» – 29–36%	«10» – 77–84%
«5» – 37–44%	«11» – 85–92%
«6» – 45–52%	«12» – 93–100%

6. Progress testing – paper and pen test (skill level).

7. Final achievement testing – module test: to set the final score, the rating indicator is determined (the percentage of the sum of points from all modules to the maximum possible) and is translated into a score according to the given rating interval scale.

Ø **General education direction**

Model B: indirect-modular-basic

1. Training parameters and the relationship between them:

a) theoretical components – 20%;

b) basic practical actions (skills) – 60%;

c) homework and the state of keeping notebooks – 20%.

2. The structure of knowledge components:

a) concepts, their properties (theorems, formulas);

b) single practical actions (skills), i.e. performing mathematical operations, solving equations, inequalities, calculating.

c) algorithms for performing mathematical operations, solving equations and inequalities (systems).

3. Evaluation criteria: indirect-modular assessment; the starting position in determining the total number of points of the Module can be the total number of points for completed homework. For example, suppose the Module has 10 homework. In that case, the maximum amount of points for them can be 30 (each correctly completed homework is evaluated in 3 points), then 30: 0.2 = 150 points – the total score of the Module. Of these, 20% – credit test, i.e. 30 points; homework – 30 points; a test – 90 points. The rating indicator for the semester (year) is a percentage of the sum of points of educational parameters for the semester (year) to the maximum possible amount.

4. Rating scale: 12-point.

5. Interval scale of transition to assessment:

«1» – 0–13%	«7» – 59–67%
«2» – 14–22%	«8» – 68–76%
«3» – 23–31%	«9» – 77–85%
«4» – 32–40%	«10» – 86–90%
«5» – 41–49%	«11» – 91–95%
«6» – 50–58%	«12» – 96–100%

6. Progress testing:

a) theoretical components – credit;

b) basic practical actions (skills) – paper and pen assessment.

7. Final achievement testing – module test: to set the final score, the rating indicator is determined (the percentage of the sum of points from all modules to the maximum possible) and is translated into a score according to the given rating interval scale.

Thus, depending on the learning profile, assessment models in mathematics encourage students to deeply master mathematical knowledge and practical skills (model A); or facilitate the learning process by shifting the emphasis on the student achievements in the essential functional mathematical operations without substantiating their theoretical foundations through motivational mechanisms (attendance and homework) (model B) (see Fig. 2).

The study of mathematics by students of humanities classes contributes to their awareness of the role and place of mathematics in scientific knowledge, the disclosure of applied possibilities of science in various fields of human activity. Simultaneously, in general classes, attention is paid to theoretical knowledge, although it is unnecessary to memorise all formulas and their proofs from all students. In particular, there is the possibility of a differentiated approach when students can independently choose to prove individual formulas. However, the main focus is on the acquisition of basic knowledge selected in advance. Noteworthy

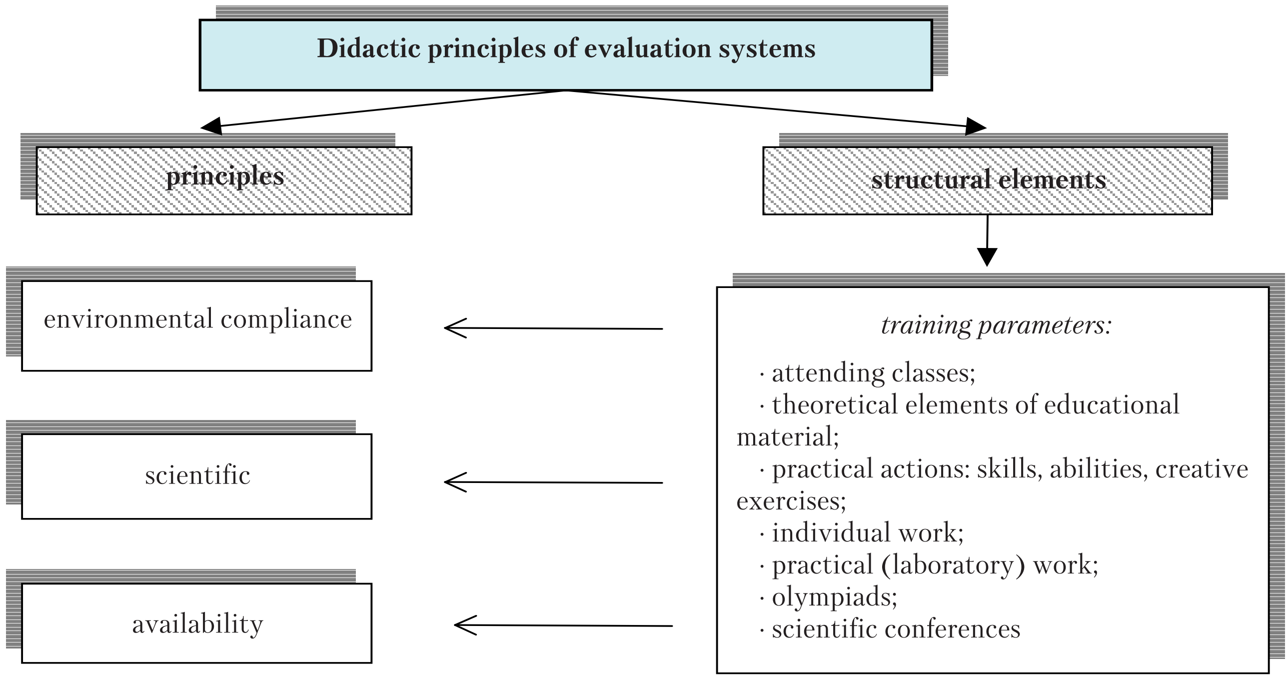

Figure 2. **Assessment model of student achievement**

Developed by the authors

that mastering the subject (algebra and the beginnings of analysis) in senior classes is allocated only for two weeks, requiring minimal material study. Therefore, it is advisable to organically combine theoretical material with problem-solving, considering students' needs in extra mathematical training. After all, studying at school, a student can not get a stock of knowledge for life. Still, students must acquire competence and develop thinking to evaluate new facts, phenomena, and ideas that they will meet in public life. Therefore, the designed assessment models encourage the students' knowledge, skills, abilities; inform them about all activities monitored and evaluated by a teacher; provide peer- and self-assessment. Besides that, the assessment models offer the students with self-confidence, motivate their learning activities.

Discussion. According to the research objectives, three assessment models of high school students' academic achievements have been designed, adapted to students' education profiles and tested through diagnostic and ascertain pedagogical experiment*s*. The diagnostic investigation (the first stage) outlined the general picture of a researched problem. The confirmation experiment allowed verifying the assessment models' effectiveness. It included observations, interviews, lesson analysis and approaches to assessing student achievement in schools. Besides that, we conducted a survey to indicate the respondents' attitude to their academic achievement assessment. The respondents were 96 teachers and 366 high school students (see Tables 1–2).

It turned out that 196 (53,6%) students surveyed favoured the assessment in the educational process. However, only 94 respondents (25,7%) consider their assessment consistently objective, 76 (35,2%) students – primarily biased. Simultaneously, 217 students believe that assessment plays an informative task, particularly about their knowledge, 84 (23%) respondents believe that assessment is vital for studying specific subjects, and 65 (17,8%) students answered that assessment provides feedback.

The questionnaire analysis revealed that assessment plays an essential role in the educational process (142 (53,6%) high school students want their knowledge to continue to be assessed). At the same time, 187 (51,1%) respondents answered that students should not evaluate themselves and their classmates, but 114 (31,1%) respondents answered that they would evaluate their classmates' knowledge. According to 293 (80%) students, the assessment scale significantly affects the quality of education. On the one hand, 139 (38%) students believe that increasing the assessment scale affects the learning outputs and objectivity. On the other hand, 180 (49,2%) respondents stated that the evaluation does not improve their learning achievements. The majority of respondents, 54,4% (199 students), determine the need to study mathematics as it increases the chances of entering the HEIs. However, 307 (83,9%) students noted that the Module score in mathematics is derived as the arithmetic average of all grades for the Module (participation grades, grades for individual work, and self-check tests).

The survey revealed that many teachers face challenges in grading students. However, 37 teachers (38,5%) overcome this problem in coordinating the assessment with the student knowledge, 22 (22,9%) – with the importance of educational parameters (progress test, homework, and self-study). Teachers proved that with the increase of the assessment scale, there is a contradiction between the students' knowledge and objective assessment. It occurred due to the complexity of the evaluation ratio to a particular array of educational material and adequate criteria development. In that

Table 1

High school students' attitude to their achievement assessment

Do you need the assessment?		
Yes	No	I do not know
53.6%	24.6%	21.9%

Assessment objectives in the educational process		
Getting feedback	Informs about the students' knowledge	Stimulates to study subjects
17.8%	59.3%	23%

How often do you need the assessments to be conducted?		
Always	Never	Sometimes
38.8%	6%	52.2%

Which evaluation scale do you think is more objective?			
2-point (credit/no credit)	5-point	12-point	100-point
3.3%	29.5%	15%	52.2%

How does increasing the grade scale affect achievements?			
Significantly affects	Increases assessment objectivity	It does not affect	Exacerbates conflicts between students and teachers
25.1%	38%	49.2%	21.9%

Should students evaluate themselves, their classmates?		
Yes	No	We practice it
31.1%	51.1%	17.8%

Would you be able to assess your and your classmates' knowledge?		
Yes	No	I do not know
53.6%	12%	34.4%

What motivates you to study mathematics systematically?					
Thematic certification	Daily parental monitoring	Increased interest in the subject	HEI entering	Desire to be the 1-st student among classmates	I do not study systematically
36.9%	12%	21.9%	54.4%	5.2%	26.2%

How do you get the Module score in mathematics?	
Based on the final test	The average sum of all grades for the Module
16.1%	83.9%

Developed by the authors

Table 2

Teachers' attitude to the students' achievement assessment

What difficulties arise in grading students? For example, is it difficult to agree on a particular grade (1–12)?		
The student knowledge	The knowledge elements significance	The importance of the educational parameters (progress test, homework, and self-study)
40.2%	23.9%	35.9%

Do you continue to focus on the 5-point scale when setting grades?	
Yes	No
45.7%	54.3%

Do you provide students' self-assessment?		
Yes	For facilitating teachers' assessment of the homework	No
35.9%	27.2%	37%

What should be the rating scale for high school students?			
2-point (credit/ no credit)	5-point	12-point	100-point
1.1%	8.7%	9.8%	80.4%

Developed by the authors

case, a direct assessment is not objective (42 (43,7%) surveyed teachers compare the scores of the 12-point system with a 5-point one). Besides that, the majority of respondents (58 teachers – 60,4%) provide students' self-assessment in their pedagogical activities. However, 26 (27,1%) teachers use self-assessment for facilitating their testing over students' homework.

The main finding in our research based on the survey results is that the majority of respondents (191 students – 52,2% and 74 teachers – 77,1%) choose the 100 points assessment scale as the most objective one.

At the next stage of the experiment, didactic principles of assessment were singled out and substantiated, which led to building adapted assessment models of students' academic achievements, taking into account the learning profile. We determine that the tested assessment models (A, B, C) are excellent and appropriate for teaching mathematics (algebra) and physics.

During the confirmation experiment, we adjusted the methodology for implementing assessment in high schools' educational process. Overall, 366 students and 92 teachers participated in an experimental study from three Ukrainian cities. Particularly students of 6–11 years of schools in Lviv (Lyceum № 18 Lviv City Council, School № 67, Lviv Secondary School № 82, Lviv Evshan Gymnasium, Grono Lyceum, School № 73; Intellect Gymnasium, Specialized School № 247 with in-depth study of foreign languages); Khmelnytsky (Lyceum №15 named after O. Spivachuk, School № 13 named after K. M. Chekman, School № 5 named after S. Efremov); Kyiv School № 130.

We choose a sample observation method to determine the effectiveness of pedagogical assessment models. A representative sample consisted of parallel testing and experimental classes. A Student's t-test served as an indicator of reliability. The level of significance is α = 0.05 (5%). It allowed concluding the effectiveness of assessing student achievement with a reliable level of probability P = 0.95. Comparison of the obtained results showed that the success rates in the experimental classes evaluated in the simulated evaluation model were much better than in testing classes with traditional evaluation approaches. The actual value of the student's t-test was higher than that determined in the table. It indicates the significance of the results obtained and confirms that assessing student achievement in the models is efficient. Changes in students' performance in testing and experimental classes from the module «Trigonometric functions» are presented in Fig. 3. It shows that students' success in experimental classes is much higher than in parallel testing ones.

Besides that, we conducted an experimental study for a small sample to test the effectiveness of innovative approaches to assessing student achievement. The small sample results were evaluated by «correcting» the sample standard deviation and using the student's probability distribution law.

Analysis of the formative experiment results confirms the effectiveness of assessing student achievement, used in our assessment models, compared with traditional ones. It manifested in students' better performance in experimental classes, greater motivation to learn, particularly in performing independent and homework, participation in self-assessment of certain types of work. Comparing new approaches to assessing student achievement (experimental classes) with traditional (testing classes), we note that student performance has changed qualitatively. Namely, the number of entry points has almost doubled in experimental classes, and as a result – increased the number of points in the high-level range. The number of positive grades of average and sufficient levels is also increased (see. Fig. 3).

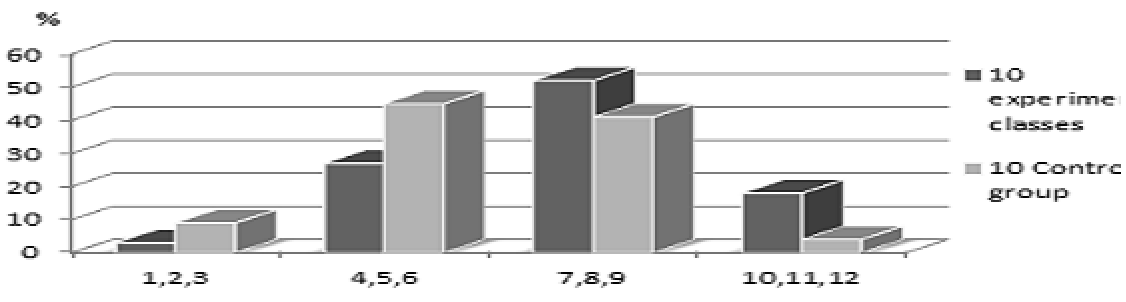

Figure 3. **Student performance in testing and experimental classes**

Developed by the authors

Conclusions. We proved that assessing students' knowledge and skills in module learning encourages the systematic study, motivates educational activities and self-learning, enables students' involvement in the evaluation process, thus creating conditions for developing an active and creative personality. Furthermore, the assessment approaches used in the study ensure democracy and openness of testing and assessment activities, minimise the assessment subjectivity, thereby strengthening the crucial factors of module learning.

The pedagogical experiment results show that the developed assessment models in module learning are practical and efficient. Students of experimental classes (compared to the same skills of students in testing classes) have a higher performance level. On the one hand, it occurs due to module learning technology, and on the other hand, it is a new approach to assessing student achievement.

The study does not cover all aspects of the research problem. In particular, it is worth noting the study of educational material generalisation and its adaptation to different learning profiles.

References

Abdullah, N. A. (2021). Predicting Student Performance Using Data Mining and Learning Analytics Techniques: A Systematic Literature Review. *Applied sciences-based,* 11 (1), 237. https://doi.org/10.3390/app11010237.

Boichenko, E. B., Bakhov, I. S., Martynovych, N. O., Shestopalova, I. O. & Binytska, K. M. (2020). Building research work skills in students as a component of their professional training. *Journal of Advanced Research in Dynamical and Testing Systems,* 12 (4), 840–848. 10.5373/JARDCS/V12SP4/20201554

Borch, I., Sandvoll, R. & Risor, T. (2020). Discrepancies in purposes of student course evaluations: what does it mean to be «satisfied»? *Educational Assessment, Evaluation and Accountability,* 32 (1), 83–102. 10.1007/s11092-020-09315-x

Lile, R. & Bran, C. (2014). The Assessment of Learning Outcomes. *Procedia – Social and Behavioral Sciences,* 163 (19), 125–131. https://doi.org/10.1016/j.sbspro.2014.12.297

OPU. Ocena pomagająca się uczyć. https://sus.ceo.org.pl/warsztaty-sus/ocena-pomagajaca-sie-uczyc

OSPNW. Ocena szkolna w procesie nauczania i wychowania. http://www.mochnaczka.com.pl/pl/44059/0/Ocena_szkolna_w_procesie_nauczania_i_wychowania.html

Ocenianie – propozycje zapisów w statucie szkoły. https://portal.librus.pl/szkola/artykuly/ocenianie-propozycje-zapisow-w-statucie-szkoly

Qarshiboev, S. and Berdiyorov, T. (2020). Shifting to a European Credit Module System in Uzbekistan, impact and perspectives to vocational education, *Journal of critical reviews,* 7 (12), 553–559. http://dx.doi.org/10.31838/jcr.07.12.101

Shepard, L. A. (2019). Classroom assessment to support teaching and learning. *The ANNALS of the American Academy of Political and Social Science,* 683 (1), 183–200. https://doi.org/10.1177/0002716219843818

Syaifuddin, M. (2020) Implementation of Authentic Assessment on Mathematics Teaching: Study on Junior High School Teachers. *European Journal of Educational Research*, 9 (4), 1491–1502. 0.12973/EU-jer.9.4.1491

Wirawan, S., Supraptono, S., Meddaoui, A., Samsudi S. & Widodo, J. (2020). Study on assessment and factors supporting successful vocational high schools student of industrial class. *International journal of innovation and learning,* 28 (2), 262–275. https://doi.org/10.1504/IJIL.2020.10030498

Abramtsov, R. (2018). Fenomen nerefleksivnoyi (emocijnoyi) svidomosti Sartre [Sartre's phenomenon of non-reflexive (emotional) consciousness]. *Psychology of Personality,* 9 (1), 16–21. https://doi.org/10.15330/ps.9.1.16-21

Bytsyura, Y. (2002). Modular-rating system of teaching economics [Modulno-rejtingova sistema vikladannya ekonomiki]. *Geography and basics of economics in school,* 6, 24–25.

Bilyakovska, O. O. (2008). *Didaktichni zasadi ocinyuvannya navchalnih dosyagnen starshoklasnikiv v umovah modulnogo navchannya [Didactical foundations of high school students' assessment in the conditions of module teaching].* Extended abstract of candidate's thesis: 13.00.09 – Theory of Teaching. National Pedagogical Dragomanov University.

Korsak, K. (2003). Pedagogical dimensions – XXI: Interviews, exams, tests. *Primary school,* 6, 1–4.

Parinova, G. K. and Grishina, N. Yu. (2003). Formation of student success by rating testing. *School technologies.* 6, 94–99.

Savchenko, O. Ya.; Bibik, N. M.; Baibara, T. M.; Vashulenko, M. S.; Koval, N. S. (2012). *Dydaktyko-metodychne zabezpechennia kontroliu ta otsiniuvannia navchalnykh dosiahnen molodshykh shkoliariv na zasadakh kompetentnisnoho pidkhodu [Didactic-methodical support of control and evaluation of educational achievements of junior schoolchildren on the basis of competence approach].* Pedagogichna Dumka.

Sikorsky, P. I. (1997). *Modular rating system of education in lyceums [Modulno-rejtingova sistema navchannya u liceyah].* Academic Express.

Sikorsky, P. I. (2004). *Kreditno-modulna tehnologiya navchannya [Credit-module learning technology].* European university.

Khurlo, L. (2003). Models for assessing student achievement (Based on the reform of elementary school in Poland). *School technologies,* 6, 84–87.

Список використаної літератури

1. Abdullah N. A. Predicting Student Performance Using Data Mining and Learning Analytics Techniques: A Systematic Literature Review. *Applied sciences-based*. 2021. № 11 (1). P. 237. DOI: https://doi.org/10.3390/app11010237

2. Boichenko E. B., Bakhov I. S., Martynovych N. O., Shestopalova I. O., Binytska K. M. Building research work skills in students as a component of their professional training. *Journal of Advanced Research in Dynamical and Control Systems*. 2020. № 12 (4). P. 840–848. DOI: 10.5373/JARDCS/V12SP4/20201554

3. Borch I., Sandvoll R., Risør T. Discrepancies in purposes of student course evaluations: what does it mean to be «satisfied»? *Educational Assessment, Evaluation and Accountability*. 2020. № 32 (1). P. 83–102. DOI: 10.1007/s11092-020-09315-x

4. Lile R., Bran C. The Assessment of Learning Outcomes. *Procedia – Social and Behavioral Sciences*. 2014. № 163 (19). P. 125–131. DOI: https://doi.org/10.1016/j.sbspro.2014.12.297

5. Ocena pomagająca się uczyć. URL: https://sus.ceo.org.pl/warsztaty-sus/ocena-pomagajaca-sie-uczyc (дата звернення: 13.09.2021).

6. Ocena szkolna w procesie nauczania i wychowania. URL: http://www.mochnaczka.com.pl/pl/44059/0/Ocena_szkolna_w_procesie_nauczania_i_wychowania.html (дата звернення: 13.09.2021).

7. Ocenianie – propozycje zapisów w statucie szkoły. URL: https://portal.librus.pl/szkola/artykuly/ocenianie-propozycje-zapisow-w-statucie-szkoly (дата звернення: 12.09.2021).

8. Qarshiboev S., Berdiyorov T. Shifting to a European Credit Module System in Uzbekistan, impact and perspectives to vocational education. *Journal of critical reviews*. 2020. № 7 (12). P. 553–559. DOI: http://dx.doi.org/10.31838/jcr.07.12.101

9. Shepard L. A. Classroom assessment to support teaching and learning. *The ANNALS of the American Academy of Political and Social Science*. 2019. № 683 (1). P. 183–200. DOI: https://doi.org/10.1177/0002716219843818

10. Syaifuddin M. Implementation of Authentic Assessment on Mathematics Teaching: Study on Junior High School Teachers. *European Journal of Educational Research*. 2020. № 9 (4). P. 1491–1502. DOI: 0.12973/eu-jer.9.4.1491

11. Wirawan S., Supraptono S. Anwar Study on assessment and factors supporting successful vocational high schools' student of industrial class. *International journal of innovation and learning*. 2020. № 28 (2). P. 262–275.

12. Абрамцьов Р. Феномен нерефлексивної (емоційної) свідомості Сартра. *Психологія особистості*. 2018. № 9 (1). P. 16–21. DOI: https://doi.org/10.15330/ps.9.1.16-21

13. Бицюра Ю. Модульно-рейтингова система викладання економіки. *Географія та основи економіки в школі*. 2002. № 6. С. 24–25.

14. Біляковська О. О. Дидактичні засади оцінювання навчальних досягнень старшокласників в умовах модульного навчання. Дис... канд.пед.наук: 13.00.09 – теорія навчання. Київ: Національний педагогічний університет імені М.П. Драгоманова, 2008. 236 с.

15. Корсак К. Педагогічні виміри – XXI: Інтерв'ю, іспити, тести. *Початкова школа*. 2003. № 6. С. 1–4.

16. Паринова Г. К., Гришина Н. Ю. Формирование успешности учащихся средствами рейтингового контроля. *Школьные технологии*. 2003. № 6. С. 94–99.

17. Савченко О. Я., Бібік Н. М., Байбара Т. М., Вашуленко М. С., Коваль Н. С. Дидактико-методичне забезпечення контролю та оцінювання навчальних досягнень молодших школярів на засадах компетентнісного підходу: колективна монографія. Київ: Педагогічна думка, 2012. 191 с.

18. Сікорский П. І. Модульно-рейтингова система навчання у ліцеях: Навчально-методичний посібник. Львів: Академічний експрес, 1997. 96 с.

19. Сікорский П. І. Кредитно-модульна технологія навчання. Київ: Видавництво Європейського університету, 2004. 127 с.

20. Хурло Л. Модели оценки достижений учеников (На материале реформы начальной школы в Польше). *Школьные технологии*. 2003. № 6. С. 84–87.

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ПЕДАГОГІЧНА МОДЕЛЬ МОДУЛЬНОГО ОЦІНЮВАННЯ НАВЧАЛЬНИХ ДОСЯГНЕНЬ УЧНІВ СТАРШИХ КЛАСІВ: ДОСВІД УКРАЇНИ

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У статті розглянуто сучасні підходи до оцінювання в закладах освіти на основі аналізу різних оціночних шкал (діапазон від трьох до ста балів). У процесі диференціації основних принципів, функцій, критеріїв оцінювання встановлено, що для українських шкіл характерні такі види оцінювання: попереднє, потокове, тематичне, підсумкове.

Охарактеризовані особливості функціонування модульної технології навчання в умовах 12-бальної системи оцінювання, визначені вимоги, умови, принципи та елементи організації модульного навчання. Науково обґрунтовані дидактичні можливості даної технології в процесі формування нових підходів до оцінювання навчальних досягнень школярів, доведені її переваги в порівнянні з традиційною системою навчання.

Запропоновано три моделі контрольно-оцінних систем для середньої школи, що передбачають математичний, гуманітарний і загальноосвітній напрямки.

В результаті експериментального дослідження виділено основні елементи контрольно-оцінної діяльності: навчальні параметри, структура компонентів знань предмета, критерії, шкала оцінок, інтервальна шкала переходу до оцінок, форми підсумкового і локального контролю.

Результати формуючого експерименту свідчать про те, що розроблені підходи до оцінювання навчальних досягнень старшокласників є більш ефективними в порівнянні з традиційними. Це простежується в більш високій успішності та мотивації до навчання, зокрема в процесі виконання самостійних (особливо домашніх) завдань. Результати підтверджують необхідність використання нових підходів до оцінювання навчальних досягнень школярів.

Ключові слова: ***модульне оцінювання; навчальні досягнення; педагогічна модель; старші класи; учні.***

ПЕДАГОГИЧЕСКАЯ МОДЕЛЬ МОДУЛЬНОЙ ОЦЕНКИ УЧЕБНЫХ ДОСТИЖЕНИЙ УЧАЩИХСЯ СТАРШИХ КЛАССОВ: ОПЫТ УКРАИНЫ

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В статье рассмотрены современные подходы к оцениванию в учебных заведениях на основе анализа различных оценочных шкал (диапазон от трех до ста баллов). В процессе дифференциации основных принципов, функций, критериев оценивания установлено, что для украинских школ характерны следующие виды оценивания: предварительное, потоковое, тематическое, итоговое.

Охарактеризованы особенности функционирования модульной технологии обучения в условиях 12-балльной системы оценивания, определенные требования, условия, принципы и элементы организации модульного обучения. Научно обоснованы дидактические возможности данной технологии в процессе формирования новых подходов к оцениванию учебных достижений школьников, доказаны ее преимущества по сравнению с традиционной системой обучения. Предложены три модели контрольно-оценочных систем для средней школы, предусматривающие математическое, гуманитарное и общеобразовательное направления.

В результате экспериментального исследования выделены основные элементы контрольно-оценочной деятельности: учебные параметры, структура компонентов знаний предмета, критерии, шкала оценок, интервальная шкала перехода к оценкам, формы итогового и локального контроля. Результаты формирующего эксперимента свидетельствуют о том, что разработанные подходы к оценке учебных достижений старшеклассников являются более эффективными по сравнению с традиционными. Это прослеживается в более высокой успеваемости и мотивации к обучению, в частности в процессе выполнения самостоятельных (особенно домашних) заданий. Результаты подтверждают необходимость использования новых подходов к оцениванию учебных достижений школьников.

Ключевые слова: ***модульное тестирование; педагогическая модель; старшие классы; учебные достижения; ученики.***