TECHNOLOGY FOR ASSESSING LEARNING OUTCOMES AT SCHOOL IN THE CONTEXT OF COMPETENCE DEVELOPMENT

Ion Akiri, Dr. Sc., Assoc. Prof.
Coordinating Researcher,
"Ion Creangă" State Pedagogical University
Kishinau, Republic of Moldova
iakiri8@gmail.com
https://orcid.org/0000-0002-8874-2329

To cite this article: Akiri, I. (2024). Technology for assessing learning outcomes at school in the context of competence development. *Education: Modern Discourses, 7*, 121–130.
https://doi.org/10.37472/2617-3107-2024-7-12

Abstract. *The article considers the problem of assessment learning outcomes at school in the context of competence development. It is proved that technologies, methods and techniques play a pivotal role in tracking progress and ensuring that students achieve the intended learning objectives. The methodology for assessing learning outcomes in schools involves systematic approaches to measure students' knowledge, skills, attitudes, and competencies. A robust methodology ensures that assessments are fair, valid, reliable, and aligned with educational objectives. It was found out that introduction of the paradigm of competence development requires modernization of the process of school learning outcomes assessment. In the context of modern requirements of education reform pedagogical assessment should be based on the fundamental principles that are determined in the article. The system of principles of school learning outcomes assessment is presented. The principle of positivity in assessment is formulated. Aspects of application of some methods and techniques of assessment in the learning process for different types of assessment are presented. In the process of research it was established the most significant role of assessment is to provide the continuous and appropriate feedback needed by students, parents, governing bodies and the general public alike. Thus, in the integrated educational process of teaching-learning-assessment, the assessment component plays a major role, which is of exceptional importance psychological, pedagogical, professional and social. It is concluded that assessing learning outcomes is a fundamental aspect of education. It ensures that students achieve the intended goals of their learning journey and supports the continuous improvement of teaching practices and educational systems.*

Keywords: *assessment; types of assessment; assessment principles; competency; school learning outcomes; technology; assessment methods; assessment techniques.*

INTRODUCTION, PROBLEM STATEMENT

In modern education, assessing learning outcomes is crucial for developing students' competencies. Competence-based education emphasizes the development of practical skills, critical thinking, and the ability to apply knowledge in real-life situations. Assessment technologies, methods and techniques play a pivotal role in tracking progress and ensuring that students

achieve the intended learning objectives. Assessing learning outcomes is a cornerstone of effective education. It helps ensure that students acquire the necessary knowledge, skills, and competencies to thrive academically and personally. Assessing learning outcomes is essential due to the following key reasons:

Measures Learning Effectiveness. Assessment provides insights into whether students are achieving the intended educational goals. It evaluates how well teaching strategies, curricula, and learning materials are working.

Identifies Gaps in Knowledge and Skills. Through assessment, educators can pinpoint areas where students struggle and provide targeted interventions. This ensures no student is left behind.

Supports Competency Development. Modern education focuses on developing practical competencies, such as problem-solving, critical thinking, and collaboration. Assessments aligned with these goals measure not just academic performance but real-world readiness.

Enhances Student Motivation. Regular assessments help students understand their progress, strengths, and areas for improvement. Constructive feedback encourages a growth mindset and fosters intrinsic motivation.

Informs Teachers and Schools. Assessment learning outcomes guide teachers in adjusting their instructional methods and curriculum design. Schools can also use this data for policy-making, resource allocation, and professional development.

Prepares Students for Future Challenges. Assessments simulate real-life challenges and promote the application of knowledge. This is crucial for preparing students for higher education, the workforce, and societal roles.

Promotes Accountability. Assessments hold both students and educators accountable. They ensure that educational objectives are met and that the education system delivers quality learning experiences.

Facilitates Comparability. Assessment outcomes provide a standardized measure to compare performance across individuals, schools, or regions. This helps identify best practices and areas for improvement in the education system.

Assessing learning outcomes at school is not just about grades; it is a tool for growth, improvement, and ensuring quality education. It helps shape a student's academic journey and prepares them for lifelong learning.

METHODOLOGY

The methodology for assessing learning outcomes in schools involves systematic approaches to measure students' knowledge, skills, attitudes, and competencies. A robust methodology ensures that assessments are fair, valid, reliable, and aligned with educational objectives.

The problem of technology for assessing learning outcomes has been studied by researchers from different countries, including L. Li, X. Liu & A. L. Steckelberg (2010), I. Akiri & A. Laşcu (2020), Y. Pan (2009), O. Rey (2012), D.R. Sadler (1989), V. Stratan (2020), S. Cristea (2017), I. Starahina (2022), A.V. Hrivko & L.S. Vashchenko (2021), E.N. Kokhaeva (2014) and others.

All scientists agree that first it is needed to define learning outcomes. Learning outcomes must be clearly stated, measurable, and aligned with the curriculum. Utilize frameworks like Bloom's Taxonomy to define cognitive (knowledge), affective (attitudes), and psychomotor (skills) objectives. The next stage should be choosing of assessment types. Effective methodologies integrate various types of assessments to provide a comprehensive view of student progress: formative assessments, summative assessments, diagnostic assessments, performance-based assessments.

It is impossible to do without selecting assessment tools. There are traditional tools (written exams, essays, and oral exams are effective for evaluating theoretical knowledge),

digital tools (platforms like Google Forms, Kahoot! and Edmodo allow for interactive and automated assessments), rubrics (provide detailed scoring guidelines for subjective tasks like essays).

Learning outcomes assessment should be aligned with competence development. Integrate assessments with real-world tasks to evaluate competencies such as collaboration, critical thinking, and creativity. Use tools like competency matrices to measure students' proficiency in targeted areas.

The other crucial element of assessment is establishing of clear criteria. Rubrics and grading scales should be used to ensure objectivity and transparency. Assessment criteria could be shared with students to foster understanding and trust. Data have been received must be analyzed and interpreted. Data analytics tools could be used to evaluate patterns in student performance. Conduct item analysis to identify questions that were too difficult or too easy. It is significant to provide feedback of learning outcomes assessment: it has to be constructive, timely, and actionable. Students should be encouraged self-reflection and goal setting based on feedback.

MAIN RESULTS

The introduction of the paradigm of competence development requires modernization of the process of assessment school learning outcomes. In the context of modern requirements of education reform, we believe that pedagogical assessment should be based on the following fundamental principles (Achiri & Laşcu, 2020):

I. Assessment is an ongoing process and an essential part of the educational process and in the national education system.

In this context, the trinity of the modern educational process is realized: teaching-learning-assessment. Thus, modern didactics considers the educational process as a simultaneous process of teaching-learning-assessment.

II. Grading identifies and stimulates a student's successes, but not his failures and does not punish them.

This principle emphasizes the stimulating nature of assessment. Assessment should not restrain or reduce the motivation of the actors of the educational process, but on the contrary, support and stimulate them in achieving the planned goals.

III. Assessment is based on the need to compare student preparation with the goals specific to each school discipline and the operational goals of each lesson.

It is unacceptable (from a psychological and professional deontological point of view) to teach one thing and require (in assessment) another. The requirements included in test papers and examinations must be comparable with the requirements formulated in the teaching process through objectives.

IV. Assessment is based on the state educational standards that stipulate what a student will know, be able to do, and be at the end of his or her schooling.

V. Assessment is carried out by many and various methods (traditional and modern).

VI. Assessment is a regulating process that determines the quality of school activities of students.

VII. Assessment should contribute to the correct self-assessment of the student and to the achievement of continuous improvement of his/her school success.

The most significant role of assessment is to provide the continuous and appropriate feedback needed by students, parents, governing bodies and the general public alike. Thus, in the integrated educational process of *teaching-learning-assessment*, the *assessment component* plays a major role, which is of exceptional importance psychological, pedagogical, professional and social.

In educational and management activities, assessment is an ongoing process that determines whether or not the objectives planned for the respective stage have been achieved,

whether the learning outcomes obtained is a success or a failure. In general, evaluation should be based on the ***Principle of Positive Assessment of School Learning Outcomes***:

Assessment identifies and rewards student success, but not failures and does not punish.

Assessment should be based on the manifestation of sensitivity and goodwill. It is necessary to stimulate the student to learn through praise, approval, support, through the creation of a situation of success. The new assessment system should remove students' fear of assessment and marking, increase learning motivation, and track the dynamics of school success. Assessment management sets important social tasks: to develop in schoolchildren the skills to check and control themselves, critically assess their activities, identify errors and find ways to eliminate them. Assessment and marking in the new education system should first of all record the student's achievements.

It should be understood that the main task of assessment is to determine what result was obtained as a result of the completed educational action: *success* or *failure*. This is necessary for making the right decision. If the result is *success*, we move on, achieving new goals. In case of *failure*, we analyze the situation, identify the reasons and eliminate these reasons.

Modern didactics distinguishes three main types of assessment of school learning outcomes:

1) Initial assessment, the main function of which is the forecast function.

2) Current (formative) assessment, the main function of which is the personality formation function.

3) Final (summative) assessment, the main function of which is the summation function.

Initial assessment can be carried out:

- at the beginning of a stage of study (grade 1, grade 5, and grade 10);
- at the beginning of the school year;
- at the beginning of a semester, quarter;
- at the beginning of studying a topic, chapter, module;
- at the beginning of an educational event (lesson, etc.)

The basic task of the initial assessment is to establish a initial diagnosis, identify possible deficiencies and ways to eliminate them. However, the main function of the initial assessment is the forecast function.

A special role is played by the initial assessment, carried out at the beginning of the 5th and 10th grades, the main purpose of which is to assess the educational standards provided for achievement in primary school and, accordingly, in the gymnasium.

In such cases, the following methods are most suitable for implementing this type of assessment:

- testing method;
- student portfolio assessment method;
- project method.

In general, traditional assessment methods are also acceptable for initial assessment at the beginning of a lesson:

- written work;
- oral surveys;
- oral dictations;
- graphic work;
- testing.

Formative (ongoing) assessment is an assessment carried out in the learning process, when knowledge, skills, abilities and value relationships acquired and formed by students are analyzed, receiving systematic feedback (feedback). As part of *formative assessment*, the teacher compares the student's learning outcomes with his previous results and, thus, re-

ceives feedback on the results of training, making the necessary, rational decisions. Formative assessment ensures an individual, rather than an average approach to students.

Formative assessment features are the following:

- carried out continuously in the learning process;
- helps students learn more effectively and productively;
- provides an opportunity to systematically implement feed backs;
- can be with or without marks;
- conducted on the basis of jointly developed by the teacher and students criterion;
- compares the student's learning outcomes with the previous results;
- many formative assessment technologies imply joint activity of the teacher and the student, which allows sharing responsibility for the learning outcomes.

So, formative assessment is assessment for learning. With this approach, the role of the teacher changes, the educational process is built on the basis of cooperation between its participants. Part of the authority is transferred to the student, thus transforming into self-control and self-assessment. Formative assessment allows the teacher to track the progress of each student towards the corresponding educational goals, helps him to adjust his work at an early stage. The student has the opportunity to feel responsible for his learning.

Formative assessment, as a rule, is implemented on the basis of a combination of methods and techniques. Modern didactics has developed a whole bank of such methods and techniques.

So, for *formative assessment (ongoing assessment in each lesson)*, depending on the corresponding assessment goals, the following methods are applicable:

- Independent work;
- Mini test;
- Didactic game of an assessment type;
- Practical work (virtual or real);
- Laboratory work (virtual or real);
- Graphic work;
- Systematic observation of the student in the process of educational activity (Method of accumulation of points);
- Research method;
- Self-assessment;
- Mutual verification (Achiri & Laşcu, 2020).

Also, in the context of developing competencies, the following reflective methods, techniques and methods of assessing school learning outcomes can be used (Achiri & Laşcu, 2020):

1) ***The PPP technique (Presentation, Practice and Production)***. For 3–5 minutes, students individually work on a task formulated by the teacher. Then, in pairs, they develop a common answer. The pair presents the chosen answer to the class. The answers can be assessed according to the appropriate criteria.

2) ***Peer correction***. Students exchange notebooks with completed assignments. They carefully check the completion of assignments, using the assessment scheme written on the board or on a card. They assign marks. Then they discuss them in pairs. The marks, at the teacher's discretion, can be entered in the class register.

3) ***The 3–2–1 technique***. Before the end of the lesson, students are asked to write down on a piece of paper 3 terms (concepts) from the lesson, 2 ideas about what they would like to learn more in the future and 1 skill (ability) that, in the student's opinion, was formed during the lesson. After studying the students' answers, the teacher will receive quick feedback on the effectiveness of the lesson and the students' success.

4) ***The Peer-to-peer review method*** (peer-to-peer assessment, P2P) allows students to receive feedback from each other. The class is divided into groups. Each member of the group individually completes the task, after which the teacher distributes the submitted

work among the members of the same group for assessment. Groups can complete different tasks. The check is provided with detailed instructions. Students are often given templates or algorithms for assessment so that the feedback is developmental for all members of the group. Feedback can be received from several classmates for each work. In scientific literature, peer-to-peer review is classified as formative feedback, which allows assessing aspects of work other than those that would be assessed by a teacher. The method also helps develop metacognitive skills: students, assessing similar works on the same topic, discover new ways to solve problems and learn to assess (Li et al., 2010).

5) ***The Traffic Light Technique*** is used to determine the level of assimilation of a concept or task completion. Each student has a set of 3 traffic light-colored cards. At the teacher's direction, each student raises one of the cards: green if they understood/solved the task, yellow if they are not sure, and red if they did not understand/did not complete the task. The technique can be used in grades 5–6.

6) ***"Find the Mistake" Technique***. During the lesson, the teacher deliberately offers students written assignments with errors or oral statements about any ideas, principles, or processes that contain errors. Then asks students to find and correct errors or to express their agreement/disagreement with the statement and explain their point of view. Students' performance can be assessed.

7) At the end of the lesson, students are asked to fill out the ***"Reflection Sheet"*** (Kokhaeva, 2014):

- *Today I learned that*_____
- *The discovery for me today was*_____
- *What I wanted to do, why*_____
- *The work in the group was successful (unsuccessful), because*_____
- *This work allowed me to see differently*_____
- *This work helped me understand*_____

The final (summative) assessment is usually carried out at the end of studying a chapter, module, section. It is not recommended to carry out semester final (summative) assessments. Practice proves and psychology confirms that conducting too many assessments also harms students.

It is believed that the final (summative) assessment plays a special role in the educational process is a two-hour final (summative) assessment carried out by the teacher at the end of the 4th, 9th and 12th grades. This assessment is an "internal exam" on the studied school subject, allowing to make a final judgment, based on educational standards, on what results the student has achieved during the course of study and to state the fact at what level school competencies in the subject have been formed.

Summative assessment provides the basis for assigning grades, while formative assessment ensures the student's personal progress in learning and his motivation for further development.

Thus, summative assessment is used at the final stage of mastering a certain subject section or stage of learning. It can be internal and external. Internal summative assessment is carried out by teachers, or jointly by teachers and the school administration. External summative assessment (external national testing, exams) is carried out with the participation of education authorities upon completion of primary school, basic (grammar school) and high school.

The following methods are the most acceptable for the summative assessment:

- ***Testing method***.
- ***Comparative judgment method***.

Comparative judgment is a method of assessment in which students' papers are paired and assessed in parallel and holistically. Several raters/experts are asked to choose which of the two papers in each pair is better. Each paper is assessed several times in different pairs. The result of many such comparisons is a scale of papers: from the weakest to the strongest. Since each paper is checked several times in different pairs, the resulting rating is considered objective (Rey, 2012).

The Comparative Judgment method is based on the "Law of Comparative Judgment", derived in the 1920s by the American psychologist and founder of psychometrics Louis Leon Thurstone.

Comparative assessment is best suited for assessing tasks that do not imply a binary ("true – false") answer, i.e. for open-ended tasks such as essays, compositions, portfolios, speeches, mathematical solutions, etc. Suitable for P2P assessment, where the whole group of learners can assess each other's work.

- ***Research project method***.
- ***STEM/STEAM/STREAM project method***.
- ***Concept mapping technique***.

A concept map is a summary table, graphic diagram, or chart that allows you to identify associative links and relationships between the concepts being studied. They help students to take a holistic "top-down view" of the topic and focus on conceptual understanding rather than on mechanically memorizing concepts and terms.

They allow the teacher to assess how the student imagines the overall picture of a specific topic, chapter, or section being studied and how much their knowledge corresponds to scientific knowledge. You can draw maps on paper, but there are also special programs with a simple, intuitive interface for creating concept maps: for example, XMind (Xmind, n.d.).

Concept mapping could be used both in teaching students and in assessing their knowledge, skills and abilities.

Method "Compiling test tasks".

The teacher and the student switch roles: the children themselves create the tasks for testing. To do this, they need to structure their knowledge and assess the scope of the topic being studied.

This method helps not only to identify gaps in mastering the program, but also to increase the activity of students in the educational process. Creating tasks for tests develops critical thinking and attention. It promotes the development of interest and motivation of students to study the relevant subject.

It is important to understand that in the context of developing competencies and preparing students for life, it is important to teach students to adequately assess themselves and their work in order to make the right decision in appropriate situations, including life situations.

Self-assessment is a method in which students collect information about their learning, analyze it and draw conclusions about their progress. A prerequisite for using the self-assessment method is the availability of work assessment criteria, which students must be familiar with before starting to do the work. One of the techniques is the *Self-Assessment Sheet* with questions that force students to analyze their work during the lesson or study of the topic. This helps them answer the questions, "What am I doing well?", "What do I need to work on?", "What do I need to do next?", "How can I bridge the gaps?" (Kokhaeva, 2014).

An effective way to teach students to assess their learning outcomes correctly is the *Self-Assessment Matrix Technique*.

After completing the task, the student fills in the following Table 1:

The teacher has the right to adjust grades and marks if he/she proves that the student has overestimated or underestimated them. The final mark for completing the assignment is

determined by the teacher. The student has the right to challenge this mark if he/she proves that it is overestimated or underestimated. If the opinions of the student and the teacher do not coincide, it is necessary to agree on the positions so that the assessment is ultimately

Table 1. Self-Assessment Sheet

Question	Student's explanation	Conclusions to improve the situation
What did you have to do in the task (problem)?		
Were you able to get the result?		
Did you handle yourself completely correctly or with error?		
What was the mistake?		
Did you handle it completely yourself or assistance was provided?		
What knowledge, skills, and abilities were needed to complete the task?		
What was the level of the task (problem)?		
What is the level of success at which you completed the task (solved the problem)?		

objective.

It should be taken into account that self-analysis and self-assessment help students to realize responsibility for the results of their learning and increase their motivation for learning.

In life situations, self-analysis and self-assessment help students to realize the correctness of their decision. In this context, we believe that students should be taught to apply ***Descartes Square*** to analyze and assess the situation and make a rational decision. So, Descartes Square looks like this (See Figure 1).

We ask ourselves these four questions sequentially and answer them objectively. As a result, we make an adequate decision. You can read more about this technique in the source (Kogan, 2017).

An exam (formal assessment) is one of the main forms for the final external summative assessment of school learning outcomes at the present stage. As a rule, students solve tests as part of final exams. However, practice shows that the Testing Method is not the most effective method for assessing the level of competence formation. The Project Method is more effective. We believe that in the future, the state examination system should include the defense of STEM/STEAM/STREAM projects by students.

Improving the technologies for assessing school learning outcomes in the context of the formation and development of competencies is the prospects and tasks of further research in the field of assessing school learning outcomes.

CONCLUSIONS

Assessing learning outcomes is a fundamental aspect of education. It ensures that students achieve the intended goals of their learning journey and supports the continuous improvement of teaching practices and educational systems. Assessment verifies whether students have acquired the knowledge, skills, and attitudes outlined in the curriculum. It aligns teaching efforts with desired educational outcomes. Through assessment, educators can pinpoint areas where students are struggling. This allows for timely interventions and personalized support to address those gaps. Assessment results help teachers adapt their methods to bet-

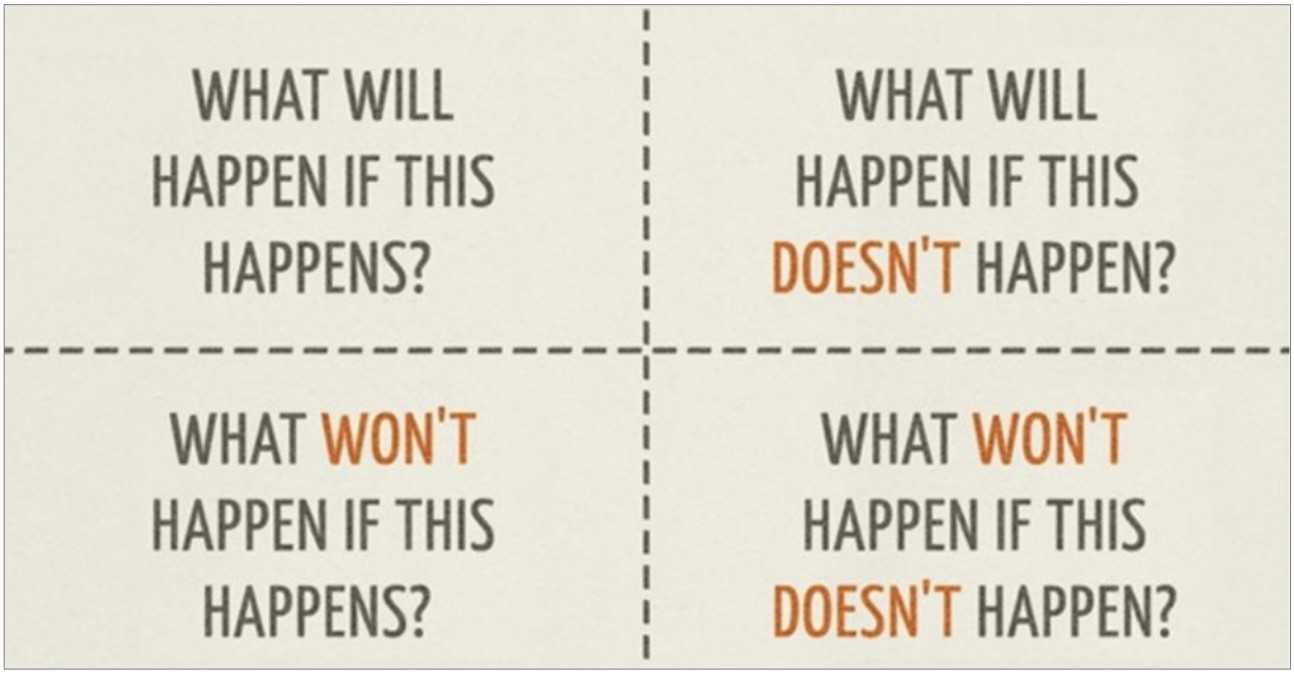

Figure 1. Descartes Square

ter meet student needs. By analyzing outcomes, educators can refine lesson plans and teaching styles to maximize effectiveness.

Assessing learning outcomes develops habits of self-reflection and self-assessment. These skills are essential for lifelong learning and adapting to a rapidly changing world. Assessment outcomes provide valuable data to inform educational policies, resource allocation, and curriculum adjustments. This ensures continuous improvement in education systems.

Assessments simulate real-life problem-solving and decision-making scenarios, equipping students with the skills needed for higher education, careers, and societal engagement. Assessing learning outcomes is not merely about assigning grades; it is a tool for fostering growth, improving education quality, and preparing students for success in a complex world. It benefits students, teachers, and the education system as a whole.

REFERENCES

Achiri, I., & Lașcu, A. (2020). Ghid de implementare a curriculumului disciplinar. Matematică. Clasele V-IX. În *Ministerul Educației, Culturii și Cercetării al Republicii Moldova. Curriculumul național. Matematică. Clasele V-IX. Curriculum disciplinar. Ghid de implementare* (pp. 76–180). Lyceum.

Cristea, S. (2017). Clasificarea metodelor de evaluare. *Tribuna Învățământului*. https://tribunainvatamantului.ro/clasificarea-metodelor-de-evaluare/

Hryvko, A.V., & Vashchenko, L.S. (2021). Potochne ta formuvalne otsiniuvannia v bazovii ta starshii profilnii shkoli. *Ukrainskyi pedahohichnyi zhurnal*, (2), 72–83.

Kogan, M. (2017). Descartes Square: a popular decision making technique. *Westminster Business Consultants*. https://wbcuk.wordpress.com/2017/04/07/descartes-square-a-popular-decision-making-technique/

Kohaieva, Ye.N. (2014). *Qalyptastyruşy bagalau: adistemelik qural*. "Nazarbaev Ziatkerlik mektepteri" Pedagogikalyq seberlik ortalygy.

Li, L., Liu, X., & Steckelberg, A.L. (2010). Assessor or assessee: How student learning improves by giving and receiving peer feedback. *British Journal of Educational Technology, 41*(3) 525–536. https://doi.org/10.1111/j.1467-8535.2009.00968.x

Pan, Y. (2009). A review of washback and its pedagogical implications. *VNU Journal of Science, Foreign Languages, 25*, 257–263.

Rey, O. (2012). Le défi de l'évaluation des compétences. *Dossier d'actualité Veille et Analyses, 76*, Article ensl01576214f. https://ens-lyon.hal.science/ensl-01576214/document

Sadler, D.R. (1989). Formative assessment and the design of instructional systems. Instructional *Science, 18*, 119–144. https://link.springer.com/article/10.1007/BF00117714
Starahina, I. (2022). Otsiniuvannia za NUSh: shcho zminylosia ta yak dopomohty vchyteliu? *Osvitoriia Media*. https://osvitoria.media/experience/otsinyuvannya-za-nush-shho-zminylos-ta-yak-dopomogty-vchytelyu/
Stratan, V. (2020). Evaluarea competenţelor în învăţământul primar. [Teza de doctor în ştiinţe ale educaţiei, Chişinău]. http://www.cnaa.md/files/theses/2020/55955/victoria_stratan_thesis.pdf
Xmind. (n.d.). Full-featured mind mapping and brainstorming tool. *Xmind*. https://xmind.app/