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The modern state of learning outcomes assessment (the case of geologist education)

Summary

Assessment is an important element of educational process. It evaluates the level of student preparation as well as influences its quality. The article focuses on methods of learning outcomes' assessment. It is based on the results of the future geologists' curricula and syllabus analysis, observation of educational process, and the survey conducted among future geologists. The study shows the imperfection of the current summative assessment of future geologists and reveals the main reasons for competencies assessment' inefficiency. The list of the most common task types that are usually being used by educators for the learning outcomes assessment of future geologists is composed; and frequency rate of their use and the students' attitude towards them is identified. Some explanations about students' bias toward the most popular (among educators) assessment methods are provided. The article proposes an assessment procedure suitable for vocational training of future geologists, starting from the assessment methods selection and up to educator's feedback.

The above assessment procedure could be useful not only for students of geology, but other fields as well. Considering the levels of information assimilation, the scale of conformity of assessment methods (tests, assignments) to the information assimilation levels has been developed and the list of tasks allowing to assess learning outcomes of geology students properly formulated. The concept of combining modern and more traditional assessment methods has been proposed.

Keywords: assessment, cases, education quality, evaluation, future geologists, learning outcomes.

Introduction. As education is becoming a key sector under knowledge economy, its quality, as well as assessment of quality and quality assessment gain urgency and importance. As the EU publication «Promoting the relevance of higher education» points out, stakeholders see a connection between the quality of education and learning outcomes, however, for many educators – people and institutions – it is still a challenge to focus on learning outcomes during program delivery and assessment process (Publications Office of the EU, 2018).

According to the trends in learning and teaching in the European Higher Education Area (Gaebel, Zhang, Bunescu & Stoeber, 2018), assessment based on learning outcomes provides more space for student development. And the existence of clear and high-quality systems of learning outcomes assessment meets the requirements of a student-based approach (Education and Training – European Commission, 2015). According to Doody and Condon (2012) assessment is one of the most important parts of learning. It has a great impact on the quality of student learning outcomes. And even more: «...institutions should not commit themselves to competency-based curricula unless they possess means to directly assess students' performance» (Harris & Keller, 1976). An appropriate assessment is one of the main tasks of an internal quality assurance system (Standards and Guidelines for Quality Assurance in the European Higher Education Area, 2015) that needs permanent monitoring and revision (Gaebel, Zhang, Bunescu &

Stoeber, 2018). That is why the search for appropriate methods of learning outcomes assessment is so urgent.

Learning outcomes cover general and specific professional competencies. So, the choice of assessment methods depends on the nature and the essence of the study programme and student specialty (McClarty, 2015).

Geo-education has aggravated over the last 20 years. This is partly due to objective reasons. On the one hand, the industry is not attractive enough for students, and their number is decreasing every year (Baker, 2006). On the other hand, the training process is outdated and does not meet labor market requirements (Gonzales & Keane, 2009). Trying to handle this, educators create their own interactive learning technologies, use methods aimed at competency formation, and discuss the major drawbacks of modern geological education (Mikes, 2015; Moles, Mortimore & Thrower, 2005; Radulescu, Buia & Csaba, 2008; Yates, Williams & Dujardin, 2005). However, there is still a lack of sources that can provide educators with guidance on procedures for professional and general competencies assessment of future geologists.

According to the National Research Council, assessment is «a mechanism for providing instructors with data for improving their teaching methods and for guiding and motivating students to be actively involved in their own learning» (2003, p. 72). That is why proper assessment will ensure a high level of vocational training of a small number of students who currently get geological education, as well as make the educational process interesting for those students who have not yet chosen their study program, and thus it will help to motivate them to choose the career of geologists. So, the *aim of the paper* is to identify the main reasons for competencies assessment` inefficiency and to determine kinds of tasks allowing to assess the learning outcomes of future geologists properly.

Method

This paper is the result of empirical and theoretical research methods combination. We analyzed future geologists` curricula, syllabus, and observed the educational process at Ukrainian universities. This allowed us to identify the list of assignments (task types) that are usually being used by teachers for assessment in geology study programmes.

Based on this information, we developed a questionnaire for students with the purpose to determine students` attitudes to assessment procedure. The survey involved 23 students (17 - 22 years old) who were getting a bachelor's or master's degree in Earth science (main subject being «Geology»). The survey was conducted completely anonymously and remotely using Google form. That allowed us to get honest answers. The questionnaire had 5 blocks with multiple-choices questions and «Likert-type scale» questions. The first block was devoted to the frequency of different assessment methods used. The second block was aimed to reveal students` opinions about the effectiveness of assessment methods. Next, we asked whether students considered the assessment procedure objective. This question was one of the key ones. Students' awareness of the objectivity of their assessment is a significant component of their learning motivation. The fourth block consisted of paired questions, whether teachers instructed students about the assessment criteria, and whether the students understood these criteria. Since students' independent work is one of the inherent training components, we also asked students how often teachers checked the results of their self-study. And we asked whether students understood the assessment criteria. The fifth block of questions dealt with the attractiveness of the methods for the students. The last block of questions was about whether teachers allowed students to challenge the grade.

Having identified the most common assessment methods, we analysed their effectiveness, weaknesses, and strengths. Having analyzed the existing levels of information assimilation and the essence of a competent-based education, we have developed a scale of conformity of the assessment methods (or tasks) to the information assimilation levels.

Results

According to the survey, tests (multiple-choice questions), open-ended questions, matching tasks, cases, situational tasks, and comparison tasks are the most common assessment methods.

As students' opinions split during the survey, we combined «always» and «often» answers in one group, and «rarely» and «never» answers into another. This approach helped to figure out the real frequency of different assessment methods use. Students' opinion about test as an assessment method is shown at Figure 1.

Figure 1. Students' opinion about test as an assessment method

According to 45,8% of respondents, this method is being used often or always. 54,2% of the respondents chose answers «rarely» or «never». Thus, educators use tests infrequently. At the same time, students believe that tests are quite effective as an assessment method: their neutral-positive and positive attitude far outweighs the negative. Also, the vast majority of respondents considered tests a highly attractive assessment method. Generalized data is presented at Figure 2.

Figure 2. Students' attitude to tests

The popularity of tests (multiple-choice questions) can be explained by their simplicity. It is much easier to choose a correct answer among available. For example, even the Gemological Institute of America – one of the world's most respected educational organization among geologists – mostly uses multiple-choice questions during the summative assessment (the data was obtained during its graduates' interview).

Students' opinion about open-ended questions as an assessment method is presented at Figure 3.

Figure 3. Students' opinion about open-ended questions as an assessment method

Open-ended questions are the most popular assessment method among the teachers, and it is used all the time (84% of respondents chose «always» or «often»). Interestingly, none of respondents chose «never». Also, open-ended questions were recognized as the most effective. However, students' attitude toward them is highly ambiguous (Figure 4).

Figure 4. The attitude of students to assessment with open-ended questions

As seen in figure 4, students' opinions are divided. Despite that answer «3» (on the Likert-type scale) is neutral, it has a positive connotation. So, we can admit that students tend to be positive about open-ended questions. The similar students' attitude is also typical for the «fill in the gaps» tasks.

Students' opinion about matching and comparison tasks is presented at Figure 5.

Figure 5. Students' opinion about matching and comparison tasks as an assessment method

According to the survey, matching tasks are not popular among educators (73,4% of respondents chose «rarely» or «never»). However, students have a positive attitude to them

(65,2% chose maximum points on the Likert-type scale, and other answers were evenly split between another options).

The majority of students (56,5%) reported that comparison tasks were not often being used. At the same time, students were quite positive about them (26,1% of respondents chose maximum points on the Likert-type scale, and 52,2% of them chose neutral – middle point).

Students' opinion about cases and situational tasks as the assessment methods are presented at Figure 6.

Figure 6. Students' opinion about cases and situational tasks as the assessment methods

Situational tasks are also being used rarely (78,2% of answers). And cases are the most unpopular assessment method among the educators (95,2% of respondents chose «rarely» or «never» answers, 30,2% of them answered «never»). We consider this situation disappointing because situational tasks and cases have the highest level of efficiency among students (Figure 7).

Figure 7.

of students to cases and situational tasks

The attitude

As it can be seen, 100% of respondents considered these assessment methods as the most effective. And students have a neutral-positive attitude toward cases and situational tasks.

The following figure summarizes the obtained data. Each of the methods was given a value from 1 (the rarest assessment method / unattractive) to 5 (the most common assessment method / the most attractive) depending on the frequency of use and the attractiveness to students (Figure 8).

Figure 8. The frequency of usage / their attractiveness for the students

As the figure shows, most of the methods have the same level of frequency of use and attractiveness to the students. Only open-ended questions (being the most common assessment method) are the least attractive.

Only 65,2% of students believe that the assessment system is «rather objective». So, the factors which make it unfair for a third of the respondents should be revealed.

First, we decided that the assessment procedure was considered biased because students did not understand the evaluation criteria. However, the survey showed that the criteria for the written and graphic works evaluation were understandable for a vast majority of students. And they confirmed that educators explained the criteria (Figure 9).

Figure 9. Students' awareness of assessment criteria/students' understanding of assessment criteria

At the same time, almost 40% of respondents did not obtain this information from their teachers. So, there is a paradox: the assessment criteria are mostly clear, but students learn about them after the assessment or get this information by themselves from classmates and senior students. Considering that, the assessment procedure bias can result from the lack of

communication between the educational process participants. That is why the assessment procedure should be clearly articulated and represented to students.

Though the learning outcomes assessment is a common approach, it does not need to be standardized (Peterbauer & Loukkoa, 2020). So, its forms can differ from one educational institution to another and even from one study programme to another within one university or faculty.

Having revised the assessment approaches (Duley, 1982), we have developed an assessment procedure, which is also suitable within vocational training of future geologists and includes the next steps.

1. An Educator is to analyze the nature of educational material and formulate the learning outcomes. Thus, the components of competency that are to be evaluated are clear. And it should be taken into account that academic courses also contribute to the development of general competencies, which assessment is also important.

2. When the educator has the list of learning outcomes, it is possible to find out how a certain learning outcome can be assessed and confirmed. It can be done with the help of graphic works, analytical papers, essays, comparison papers, answers to open-ended questions or multiple-choice tests etc. At this point, the assessment method is to be chosen.

3. Then, the educator is to create a matching between a competency level (as a result – final grade) and its indicator (the number of correct answers in a test, the depth of the answer to an open-ended question, timeliness of paper submission etc.).

4. All above information should be represented to students: the frequency of assessment, forms and types of tasks, methods etc. An educator must ensure that students understand the requirements. General grading policy and assessment criteria should be articulated clearly and given to students before the summative assessment. Furthermore, the best examples of completed tasks and papers can be given for students (Evans & Bunescu, 2020). That helps to prevent student misunderstanding of educator requirements and expectations.

5. The assessment procedure.

6. Feedback (provided by the educator).

Feedback is an important element of the procedure. It allows students to see their mistakes clearly. It creates an atmosphere of cooperation between an educator and students. It shows objectiveness in the assessment. At the same time, it helps an educator to improve tasks: to correct inaccurate formulations, avoid dubious questions etc.

Assessment feedback has a slightly different purpose than grading. It is more about «how a student could be better in his/her activities, and what needs to be improved», than a formal try to rate him/her. So, it changes student role, it turns his/her into an active participant, who can influence of take decisions, and, what is most important, be responsible for the result. That is why we agree: «...the main onus is not on the tutor to deliver the feedback, but the student to self-regulate his/her work» (Carless, Salter, Yang, & Lam, 2010).

Sustainable feedback is the main reason why a teacher can be separated but never fully eliminated from the educational process. The dual education system and internships are so popular and preferable these days because they give an opportunity for a student to get some critic and reviews from experienced colleagues on a spot, during professional activity. We agree that nowadays learners can obtain any knowledge, including competencies and skills, from textbooks, guides, videos etc. Grading can be produced automatically by some learning systems. But the very crucial part of the educational process – immediate feedback (without any repercussions for a

student) can be properly given only by an educator. That is why, ongoing feedback should be a compulsory practice within the educational process. And it cannot be limited just by assessment procedure. All kinds of student activities need feedback. It could be «written feedback on drafts or final versions of assignments; verbal comments in individual or small group tutorials; email correspondence for suggestions or comments; and collective in-class guidance or feedback». (Carless, Salter, Yang, & Lam, 2010).

Thus, sustainable feedback contributes to a habit of student self-regulation and helps students to become «lifelong learners», who are independent of educators and do not need permanent supervising (Riordan & Loacker, 2009).

It should be noted that such assessment procedure elements as «to aware students about assessment criteria, forms and methods», as well as detailed assessment feedback are declared as basic requirements in the European Education Area (Education and training - European Commission, 2015).

According to our survey, educators allow students to challenge the grade. However, 52,2% said it was a rare situation (8,7% said it had never happened). 30,4% of respondents rarely or never challenge the grade. But 56,5% always do this. Only 13% of respondents took a neutral position. It means that most of the students want to be active participants at all stages of education, including assessment. But a lot of them feel uncomfortable as unequal participants of the educational process. This also means disrupting a student-based educational approach. Partially it is caused by the students' fear to decrease their grades (21,7%). This fear can be the explanation of why some students consider an assessment process not objective – when you cannot discuss it, it is difficult to agree with the grade.

According to our survey, open-ended questions are the most difficult tasks for students. They are being always mentioned when students talk about unclear assessment criteria. And their unattractiveness is logical. Unclear assessment criteria can be explained by teachers' tendency to formulate open-ended questions incorrectly, or by the fact that the assessment result always depends on the evaluation scale. These questions usually aren't specific enough. To avoid this situation, teachers are advised to discuss their questions with students before the test or exam. Even more, educators should avoid questions like: «Are there any questions?» because they make students feel uncomfortable. Instead, it is more diplomatic to ask: «How many of you understand what we are talking about?» (National Research Council, 2003, p. 78).

But even if an educator formulates it in the most precise way, students still are not aware of how deep their answer is supposed to be. Most of them tend to use the information they have obtained from sources offered by a teacher. If the answer matches an educator's expectation and is full, it means that the student has reached the learning outcomes and deserves the highest grade. But, how should an educator assess answers which have extra information, received by students during their optional self-study? Every syllabus contains the list of compulsory learning outcomes. So, extra knowledge and skills cannot be demanded if they have not been mentioned in the syllabus. This point of view is acceptable if we use an absolute rating scale. In this case, students should get the list of compulsory learning outcomes and explanations about what students' attainments are to be assessed. But avoiding an assessment of the optional students' self-study, an educator demotivates them. Also, there are student groups with low motivation or studying ability level. And on the background of such students, some of them (with quite ordinary learning results) may seem better than they really are. That is why educators try to encourage these students and use a relative rating scale. In this case, the fullest student answer is being equaled to the best one

and gets the highest grade. All answers from other students are being compared with this referenced answer. As for us, this approach has more disadvantages than positive sides as nothing depreciates higher education like low-quality vocational training of students.

In this survey we paid much attention to students' opinion regarding the effectiveness of different assessment methods. According to the students, cases are more effective than open-ended questions and multiple-choices tests, but they are almost never used. We believe that universities use more classical and well-known assessment methods (multiple-choice tests and open-ended questions) because they have biases against educational innovations. Universities have significant training traditions, and they are often unaware of the benefits that can be brought by educational innovations. That is why they are reluctant to implement them (Publications Office of the EU, 2018).

According to scientists (Ramesh, Manjit Sidhu & Watugala, 2005; Fuhrman, 1996) well-constructed multiple-choice tasks are capable of wide range of knowledge and skills evaluation. But modern assessment involves the evaluation of complex personality's traits. «Competency is the ability to apply knowledge and skills to produce a required outcome, and the ability to do a job under a variety of conditions» (Trinder, 2009, p. 165). So, «an ability» and «readiness», which are the testaments to a gained competency, should be evaluated. Both involve: a complex of knowledge and skills, supplemented by motivation, the ability to analyze information, to build communication, decision making etc. Trying to solve this issue, the assessment of future geologists at Stockholm University (2020) involves multiple-choice questions simultaneously with student projects. This approach is more efficient because students should develop and demonstrate their ability for independent work, which is more complicated than the reproduction of information demanded by multiple-choice questions. Summative assessment in the Jagiellonian University in Poland (the data was obtained during the interviews with its undergraduates) always consists of multiple-choice questions and open-ended questions. Students are always involved in assessed practical work. What is most important, lecturers always provide a formative assessment with the aim to reveal the real level of their students, which helps to identify their misunderstanding early.

Nevertheless, assessment is quite often based on incomplete, inconsistent, and contradictory data (Encheva, 2010). Assessment of knowledge and skills only makes it more inaccurate. Even the deepest geological knowledge and skills are not the testament to the ability or, moreover, the readiness for professional activity. By the way, competency is not just an ability to conduct a professional activity, it is also an ability to act within volatile and changeable circumstances (Trinder, 2009). Therefore, competency ought to be assessed by the methods which provide for putting students into real-life situations. That is why, case-studies and situational tasks are productive as assessment methods.

Campos et al. (2020) conducted a rigorous literature analysis and proved that simulation-based learning is widely used in Europe. Having analyzed case studies from Spanish, Portuguese, Irish, and other universities, the authors figured out that simulation was being used as a teaching method for students from different fields: engineering, management, mathematics, marine ecology, etc. For example, the University of Technology Sydney (2020) combines multiple-choice questions, essays and case study reports as an assessment method.

«Cases» are real-life situations that are mostly being used as a learning method (Hammond, 2002). Being analyzed and discussed in class, they help students to sharpen their analytical and communication skills, let them «walk in real specialist's shoes». In other words, a case-study is simultaneously a high-efficiency teaching-and-learning method and assessment tool.

In search for suitable assessment methods for future geologists' learning outcomes, we arrived at the following conclusion. There are 5 levels of information studying and understanding (from the easiest to the most complicated):

0. Understanding. → 1. Recognition → 2. Reproduction → 3. Use → 4. Creativity

The following table contains the author's vision of compliance between main assessment methods and levels of information understanding.

Table 1

Compliance between main assessment methods and levels of information understanding

Levels of information understanding	Assessment methods or types of student work
Creativity	Student research; case solving and design tasks (aimed at modernization, improvement of some process); recommendation making tasks.
Use	Case solving; essay; calculus tasks with a complicated algorithm; comparison tasks (aimed to get new data); situational tasks, design tasks, coursework.
Reproduction	Open-ended questions; graphic tasks; calculus task; 'fill in the gap' tasks; simulation tasks; describing papers (abstracts); comparison tasks (without deep additional analysis).
Recognition	Multi-choices tests; matching tasks.

In our opinion, it is inappropriate to speak about the «understanding» level during learning outcomes assessment. Understanding is an inherent part of the learning process. However, if the assessment shows that students have remained at the initial (zero) level of «understanding», this means that they haven't reached learning outcomes properly. Thus, the assessment should include evaluation of formed competencies from the first level (recognizing) to the fourth (creativity) - as it is presented in Table 1. And the level of creativity is a testament to the fact that students have gained the desired competencies and reached learning outcomes.

«Recognition» level shows that a student understands the content of the question and its essence, sees the connection between objects and their properties, is able to select the right object from several offered objects, knows the object's place in a classification, is capable of linking concepts and definitions.

«Reproduction» level shows that a student is able to fill the gaps (a missing word in a definition), to correct mistakes (in a text or a formula), to solve a typical task or construct some geological graphic works (with a known algorithm), to organize some information (write an essay or paper).

«Use» level shows that a student can apply gained knowledge and skills to solve atypical tasks or use them unusually. Information analysis and synthesis are also possible at this level.

«Creativity» level is the most challenging. It shows that a student is able to gain some unknown before and qualitatively new information, to create recommendations, to design suggestions, to modernize processes or optimize them.

The most popular assessment methods among teachers (multiple-choice questions and open-ended questions) belong to the two lowest levels – recognition and reproduction. Ramesh,

Manjit Sidhu & Watugala (2005) found that multiple-choice tasks cannot measure high-level cognitive skills (as open-ended questions or essay test can). Thus, open-ended questions and essays are located higher in this hierarchy. But simple descriptive essays (papers) belong to the reproduction level because they are considered to be a rather superficial method of evaluation. Students' opinion meets this statement (Figure 10).

Figure 10. Effectiveness of papers and coursework used as an assessment method

Also, students do not consider describing essays or papers as an effective assessment method. Talking about coursework, this kind of task belongs to the «use» level because it is heuristic and requires a thorough cognitive activity. Complex coursework can even belong to the creative level. Besides, the majority of students consider coursework as an effective assessment method (Figure 10).

Assessment tasks that require to recall and to reproduce some information encourage students to study only general facts. So, their knowledge is quite superficial. While tasks that require some creativity (interpretation or analysis) make students study deeper (Miguel, Ruiz, Blas, Perea 2018). These requirements are met by cases and situational tasks. They always require creativity: suggestions, improvement, and decisions making. They allow students to develop their professional qualities more deeply. Moreover, even employers consider didactic cases an effective assessment method during job applicants interviewing. For example, some companies post different case-tasks and quizzes on their websites as supplement information, which can help potential candidates to be prepared for an interview (Schlumberger, 2020).

Cases and situational tasks make students study harder than simple multiple-choice tests or calculus tasks do; they allow students to see their actual level of preparation. Also, being accustomed to apply gained knowledge and skills, students are more prepared for real work. At the same time, the set of skills and especially attitudes, required by employers, changes rapidly (De Bakker, de Jong & Meyles, 2004, p.1). Therefore, a student who is used to solving complex cases, which requires a wide range of skills and knowledge, is more inclined to study during professional life, what makes him/her more competitive on a labor market.

Conclusions

The current state of learning outcomes assessment shows that the procedure needs to be revised and improved accordingly:

1. The first step in the summative assessment procedure is to figure out the list of learning outcomes. This is the only way to the selection of most appropriate assessment methods.

2. Chosen methods should be capable to assess all levels of knowledge acquisition: understanding information, recognition, reproduction, use, and creativity. Unfortunately, the most popular assessment methods currently used belong to the two lowest levels – recognition and reproduction. So, summative assessment with only these two methods is inaccurate.

3. According to the survey conducted among future geologists, multiple-choice questions, open-ended questions, matching tasks, comparison tasks are the most common assessment methods. They are traditional and useful, but, unfortunately, they focus only on measuring knowledge and skills instead of learning outcomes assessment. So, trying to make the assessment of future geologists as complete as possible, cases and situational tasks are suggested as the best option. Using them, we can assess not only geological (or any other) knowledge and skills, but students' readiness for professional activity as well.

At the same time traditional assessment methods should not be completely abandoned, but complemented with cases and situational tasks, making assessment process deeper and more efficient.

4. There is a lack of students' awareness of the assessment criteria and policy. That is why the proposed assessment procedure should include such phase as articulation and presentation of grading policy and assessment criteria to students. This is to prevent student misunderstanding of educator's requirements and expectations.

5. Another compulsory part is feedback (by an educator), though feedback should not be limited by an assessment procedure only. Feedback is an integral part of learning, and all kinds of student activities need feedback. It allows students to improve their work and creates an atmosphere of objectivity and cooperation between an educator and students.

At the same time, there is no doubt that an educator's personal bias may have a profound effect on student assessment. But a personal bias belongs to the ethical aspects of an educator's work and its exploration demands further research.

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Кузько Маріанна

Сучасний стан оцінювання результатів навчання (на прикладі оцінювання майбутніх геологів)

Анотація

Оцінювання є важливим елементом освітнього процесу. Воно не лише визначає рівень підготовки студентів, але й може впливати на її якість. Тому дана стаття зосереджена на методах оцінювання досягнення студентами результатів навчання. В основі статті – вивчення освітніх програм, аналіз навчальних планів й робочих програм навчальних дисциплін майбутніх геологів, спостереження за освітнім процесом та опитування студентів (проведене серед майбутніх геологів). Результати дослідження дали підстави декларувати недостатню ефективність наявної процедури оцінювання результатів навчання та виявити її основні причини. Укладено перелік найпоширеніших видів завдань, які зазвичай використовуються науково-педагогічними працівниками для оцінки результатів навчання майбутніх геологів. Створено рейтинг частоти їх використання науково-педагогічними працівниками та ставлення до них здобувачів. Висунуто кілька пояснень щодо причин упередженості здобувачів стосовно найбільш популярних (серед науково-педагогічних працівників) методів оцінювання. Розроблено процедуру оцінювання результатів навчання майбутніх геологів. Розкрито шість її кроків: від вибору методів оцінювання до постаналізу результатів оцінювання науково-

педагогічним працівником. У разі адаптації до конкретних освітніх умов дана процедура може бути використана в підготовці студентів інших спеціальностей. З урахуванням рівнів засвоєння інформації розроблено шкалу відповідності методів оцінки (або конкретних типів завдань) рівням засвоєння інформації. З урахуванням компетентнісного підходу визначено типи завдань, які дозволяють належним чином оцінити досягнення майбутніми геологами результатів навчання. Представлена концепція передбачає поєднання сучасних та більш традиційних методів оцінювання.

Ключові слова: кейси, майбутні геологи, оцінка, оцінювання, результати навчання, якість освіти.

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