to continue working in their own development projects of the laboratory. Also, the laboratory becomes a link between students and fuel and energy companies interested in personnel and the introduction of 4.0 technologies.

LITERATURE:

1. Vasenkov D.V. Methods of training artificial neural networks //Computer tools in education, 2007. – No. 1. – pp. 20-29.
2. Golovko V.A. et al. Integration of artificial neural networks with knowledge bases //Design ontology, 2018. – T. 8. – №. 3 (29). – Pp. 366-386.
3. Jane A.K., Mao J., Moiuddin K.M. Introduction to artificial neural networks //Computer, 1996. – Vol. 29. – No. 3. – pp. 31-44.
4. Order of the Ministry of Energy of the Russian Federation No. 676 dated July 26, 2017 "On approval of the methodology for assessing the technical condition of the main technological equipment and power transmission lines of electric stations and electric networks" // Collection of Legislation of the Russian Federation, 2020 – No.52.
5. Sambulova M.Yu., Zaikova A.P., Shulunova T.A. Artificial intelligence and engineering business // Actual research, 2022. – №. 19(98). – Pp. 46-48.
6. Sambulova M.Yu. VR and AR-technologies in the fuel and energy complex // Current research, 2022. – №. 29 (108). – Pp. 18-20.
7. Khalyasmaa A. I. et al. Diagnostics of electrical equipment of power stations and substations: a textbook, 2015.
8. Yasnitskiy L.N., Cherepanov F.M. Artificial Intelligence. 2012.

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CASE STUDY IN THE CONTEXT OF HIGHER PROFESSIONAL EDUCATION OF GEOLOGISTS

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The development of case methods plays an important role in the framework of the educational process, including the training of geological specialists. Geology as a fundamental science has a vast theoretical base, the useful application of which requires constant training. Such a training for students can be a case-competition which can help them to apply newly learned knowledge and skills to data, to develop additional ideas and study questions for future studies. There are different variations and examples on case-studies connected with geological sciences such as:

- Searching data observations from a published papers;
- Recent and timely geological events;
- Social responsibility as a geologist;
- Events, problems and hazards affecting local territory;
- Scientific debates on geological problems.

Learning through the task "without a correct answer" allows us to view from a different angle on knowledge, gained before, as well as independently determine what knowledge and information is still needed to correctly provide the unique solution to a specific geological problem. Case studies is a useful research tool, but it is necessary to use them wisely.

The best way to organize a case study is to work in small groups, in which each of the participants will perform certain tasks and share experience with class mates.

To organize information, it is very useful to draw up mind maps (figure 1). Such maps can be absolutely diverse, depending on the task. For example, the fundamental factor may not be the area, but the type of mineral.

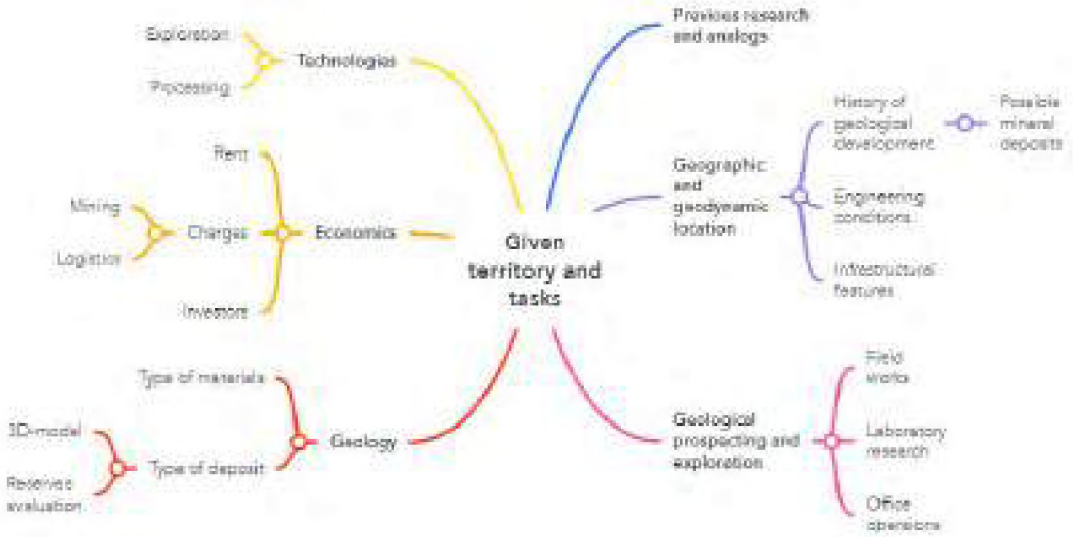

Fig. 1. Example of a mind map for geological case

First of all, it is important that the tasks of the cases are close to real production situations, including the lack of information about the object, errors in filling out field documentation, and drawing up plans as when learning occurs around a real problem, material is better retained and can be applied to another situation. Such aspects are helpful for learning the selection of useful and reliable information and require students to consider various perspectives and think critically about potential solutions.

An analysis of previously conducted works involves working with literature and authentic data, which can help substantiate the prospects of a given territory.

With the repeated conduct of cases involving various territories, types of minerals, forms of occurrence of ore bodies, a geological outlook and erudition are developed, which, in the future, helps students and specialists to analogize and offer ideas that are non-standard for such objects. Moreover, the repeated and systematic practice solidifies knowledge and long-term retention of skills.

The third positive aspect is the improving of competencies in the use of digital information systems: starting from the search for maps of a smaller scale to determine the regional geological features of the territory, ending with the construction of complex 3D models with automatic calculation of mineral reserves.

In combination with a three-dimensional view of the proposed object, used the procedure for composing a plan of geological exploration, the distinguishing feature of which is a strict sequence.

When planning exploration work, both classical and innovative methods of geophysical and mining operations are studied.

Then, when the student or team face the task of commodity-value assessment of production, it is required to collect the most up-to-date information about the demand, cost and availability of processing of the ore into an intermediate stage or final product. Such an analysis allows to convert knowledge gained from sciences such as mineralogy, petrography, chemistry etc. into a range of useful production competencies. Using various methods, the vocabulary and skills students practice to be real scientists. This process is very important for the future specialist to realize his place and his own knowledge in the profession.

The analysis of logistics for the resource movement from the place of production to the processing site, and subsequently, to the consumer, allows you to study with the state of infrastructure at the time point and plans for its development in the near future. This affects such important parameters

as the cost of raw materials, the payback of the project and the timing of its implementation from the very beginning to the final liquidation. An important part of the case solution is the preparation and presentation: graphics, numbers and text have to be on the right places. It improves public speaking skills. If you have a large class you may use different options for this within the case:

– to break the class into groups and give each group a part of a case to work in collaboration;

– to use a jagsaw, dividing the case study into "puzzle" pieces and teams of students study their individual pieces and then regroup to tackle a group question and to put the full case together;

– to use one-minute papers to get all students participating in the discussion and help them to make a self-assessment.

In general, solving cases helps students to prepare for work in production both methodologically (facilitates quick learning and immersion in the specifics of work) and psychologically. It could be also useful to incorporate short cases in the semester to help students to practice working in groups, brainstorming, and discussing before starting extended cases.

Therefore, the solution of cases is an activity on the verge of science and fantasy, an analysis of the past and an approximation of the future for a complete immersion in reality...

LITERATURE:

1. Heale R., Twycross A. What is a case study? //Evidence-based nursing, 2018. – T. 21. – № 1. – C. 7-8.
2. Yin R. K. Case study methods. – 2012.
3. Knödel K., Lange G., Voigt H. J. Environmental geology: handbook of field methods and case studies. – Springer Science & Business Media, 2007.
4. Thomas G. How to do your case study //How to Do Your Case Study. – 2021. – C. 1-320.
5. Galaktionova N. A., Gorbunov P. A., Tolstoukhova I. V. Case method as a modern technology for professional training of students in geology // Ped.Rev. 2018. No. 4 (22).

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РОЛЬ ФИЗИЧЕСКОГО И ПСИХОЛОГИЧЕСКОГО РАЗВИТИЯ В ПОДГОТОВКЕ ИНЖЕНЕРОВ

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Аннотация. Новейшие методы изучения полевых геофизических структур предопределяют использования сложного математического аппарата. Решение нетривиальных задач требует нетривиальных методов подготовки будущих инженеров, включая современные психотехнологии и физическую подготовку.

Ключевые слова: Объект исследований, предмет исследований, наукоемкость, психотехнологии, деконцентрация, фоновое мышление, базовые знания, настольный теннис, концентрация, инсайт, триггер.

Бегназарова Наргюль – серебряный призер межвузовских республиканских соревнований по настольному теннису в личном разряде, чемпионка страны в парных играх. Она – будущий инженер-геофизик, ныне – студентка третьего курса факультета геологии Международного университета нефти и газа им. Ягшигельды Какаева.

Сложности в подготовке современного геофизика обусловлены особенностями предмета изучения.