



The formation of reflective competence in students of technical universities

Sharipova Iroda Azamatovna –

Senior teacher, Navoi State University of Mining and Technology

E-mail: shi84725@gmail.com

ORCID: <https://orcid.org/0009-0005-5122-042X>

Annotation. The article examines the problem of forming reflexive competence in students of technical higher education institutions majoring in Mining and Metallurgy in English language teaching under conditions of educational modernization. The necessity of developing reflection through integrated technologies as a key component of the professional training of future mining and metallurgical engineers is substantiated. The structural components of reflexive competence are disclosed, the pedagogical conditions and complexities of its formation are defined and effective methods and technologies for implementing student self-analysis are analyzed. The results of the experimental work are presented, confirming the effectiveness of the integrated approach in teaching and how the approach influences the formation of students' reflexive competence.

Keywords: integrated skills, reflexive competence, approaches, mining, metallurgy, pedagogy, integration of disciplines, self-analysis, to adequately evaluate, reflective diary, technical university.

Формирование рефлексивной компетентности у студентов технических вузов

Аннотация. В статье рассматривается проблема формирования рефлексивной компетенции у студентов технических высших учебных заведений, обучающихся по специальности «Горное дело» и «Металлургия» в преподавании английского языка в условиях модернизации образования. Обоснована необходимость развития рефлексии с помощью интегрированных технологий как ключевого компонента профессиональной подготовки будущих инженеров горно-металлургической отрасли. Раскрыты структурные компоненты рефлексивной компетентности, определены педагогические условия и сложности ее формирования, проанализированы эффективные методы и технологии реализации самоанализа учащихся. Представлены результаты экспериментальной работы, подтверждающие эффективность комплексного подхода в обучении и то, как подход влияет на формирование рефлексивной компетентности студентов.

Ключевые слова: интегрированные навыки, рефлексивная компетентность, подходы, горнодобывающая промышленность, металлургия, педагогика, интеграция дисциплин, самоанализ, адекватно оценивать, рефлексивный дневник, технический университет.

Texnika oliy ta'lim muassasalari talabalarida refleksiv kompetentlikni shakllantirish

Annotatsiya. Maqolada ta'limni modernizatsiya qilish sharoitida Konchilik va Metallurgiya yo'nalishidagi texnika oliy ta'lim muassasalari talabalarida ingliz tilini o'qitishda refleksiv kompetensiyani shakllantirish muammosi ko'rib chiqilgan. Bo'lajak kon-metallurgiya muhandislarini kasbiy tayyorlashning asosiy tarkibiy qismi sifatida integratsiyalashgan ta'lim texnologiyasi orqali refleksiyani rivojlantirish zarurligi asoslangan. Refleksiv kompetentlikning tarkibiy qismlari ochib berilgan, uni shakllantirishning pedagogik shart-sharoitlari va murakkabliklari aniqlangan, talabalarning o'z-o'zini tahlil qilishini amalga oshirishning samarali usullari va texnologiyalari tahlil qilingan. O'qitishda integrativ yondashuvning samaradorligini va yondashuvning o'quvchilarda refleksiv kompetensiyani shakllantirishga ta'sirini tasdiqlovchi tajriba-sinov ishlari natijalari keltirilgan.

Kalit so'zlar: integrativ ko'nikmalar, refleksiv kompetensiya, yondashuvlar, konchilik, metallurgiya, pedagogika, fanlar integratsiyasi, o'z-o'zini tahlil qilish, adekvat baholash, refleksiv kundalik, texnika universiteti;

INTRODUCTION

In the context of rapid technological development and the growing demands of the modern labor market, higher education institutions are expected not only to provide professional knowledge and technical skills but also to foster students' ability for continuous self-development and critical self-assessment. One of the key competencies that enables future specialists to adapt successfully to changing professional environments is reflective competence. Reflective competence refers to an individual's ability to analyze, evaluate, and improve their own learning and professional activities through conscious self-reflection.

For students of technical universities, the development of reflective competence is particularly important because engineering and technological professions require continuous problem-solving, decision-making, and lifelong learning. Reflection allows students to assess their strengths and weaknesses, identify learning gaps, and develop strategies for professional growth. Moreover, reflective practices contribute to the formation of critical thinking, creativity, communication skills, and professional responsibility.

Modern educational approaches emphasize student-centered learning, project-based activities, digital technologies, and collaborative learning environments, all of which create favorable conditions for the development of reflective competence. Therefore, investigating the pedagogical conditions, methods, and mechanisms that support reflective competence formation among technical university students remains a significant scientific and practical task.

LITERATURE REVIEW AND METHODOLOGY

Modern trends in the development, modernization, and digitalization of higher education are characterized by a transition from a knowledge paradigm to a competency-based model for training specialists in our case, mining and metallurgical specialists. In this regard, forming students' ability to independently reflect on their activities, critically analyze and make informed decisions, evaluate themselves, and think critically is of particular importance. For students of technical universities majoring in Mining and Metallurgy, reflexive competence serves as an integral part of professional training, as engineering activities require constant analysis, evaluation, and adjustment of actions. Despite significant

attention to this problem, issues regarding the purposeful formation of reflexive competence in technical education remain insufficiently developed.

The concept and structure of reflexive competence

Reflection in a pedagogical context is understood as an individual's ability to realize and analyze their own activity, its results, and the ways they achieve their goals. It is also important to understand the experience during which the student moves from the mechanical perception of knowledge to understanding how to perceive and where to implement this or that information. One should also not exclude professional reflection, which allows a student to analyze their actions within the context of future engineering activities.

Reflexive competence includes the following components:

- ✓ cognitive (knowledge of methods for analyzing activities, ability to consider mining and metallurgical enterprises within a single system, and skills in creating mental production processes);

- ✓ activity-based (the ability to conduct self-analysis, the formation of professional competencies through professional activity);

- ✓ motivational (need for self-improvement, identification of internal and external factors that can contribute to the formation of engineering thinking);

- ✓ evaluative (the ability to adequately evaluate oneself, as well as comprehensive in nature, where fundamental knowledge is combined with professional skills).

This structure allows for the consideration of reflexive competence as an integrative quality of the individual.

Pedagogical conditions for formation

An analysis of scientific literature and practice has allowed for the identification of the following key conditions:

1. Creating a reflexive educational environment

The educational environment should encourage students to analyze their activities through dialogue, discussion, and feedback.

2. Activation of educational activities

The use of interactive teaching methods facilitates the engagement of students in the process of comprehending the educational material.

3. Integration of disciplines

The integration of humanitarian and technical disciplines, including foreign languages, is of particular importance.

4. Individualization of learning

Considering the individual characteristics of students contributes to the more effective development of reflection.

Methods and technologies for forming reflexive competence in students of technical educational institutions include the following criteria:

Reflective diary. Allows students to systematically analyze their achievements and challenges. Record them in a diary and occasionally analyze their behavior and self-esteem. A reflexive diary provides an opportunity to receive feedback from the teacher, as well as to compare grades and determine how much of students can evaluate their knowledge.

Case study method

Develops skills in analyzing professional situations and making decisions. Through professional real cases, the instructor can engage students in a professional atmosphere. To provide the student with the opportunity to solve the identified problem by integrating the English language subject with specialties such as "Mining" or "Metallurgy".

Project activity. This activity helps students independently implement their ideas related to professional activities, for example, presenting a project on the topic "Implementation of artificial intelligence for forecasting the wear and tear of mining equipment". Project activity develops the ability to plan and evaluate results.

Discussion methods. Through this method, the teacher provides students with the opportunity to exchange ideas and solve professional problems that have been artificially created. This dialogic approach, which is aimed at an argumentative search for truth, can be fully utilized in an integrated English language lesson with specialized subjects such as “Open Mining”. It stimulates critical thinking and argumentation.

Experimental work. The aim of the study is to verify the effectiveness of integrated educational technology in forming reflexive competence in students majoring in Mining and Metallurgy.

RESULTS AND DISCUSSION

The organization was conducted according to generally accepted norms. The study involved students from groups 31D-25 GD (mining) and 7B-25 KhM (chemical metallurgy). The students were divided into two groups:

1. Experimental group (EG);

2. Control group (CG);

Diagnostic methods were selected in accordance with expected results, such as:

questioning based on written responses from respondents to analyze opinions;

observing students' behavior during complex solutions to specific professional situations;

testing by conducting standardized tasks for students in the mining and metallurgy field;

a method of self-assessment that provides students with the opportunity for reflexive analysis of self-assessment and also helps evaluate the determination of improvement paths, contributing to the development of autonomy and reflexive competence among students.

Research results (Table No.1)

Level	EG (before)	EG (after)	CG (before)	CG (after)
High	18 %	42 %	20 %	24 %
Middle	46 %	44 %	48 %	50 %
Low	36 %	14 %	32 %	26 %

The result indicators indicate a positive dynamic in the experimental group, which reveals a change from 18% before the introduction of the technology and 42% after as the highest indicator; the lowest was 36% before the introduction after 14%, which confirms the effectiveness of the proposed technology and its effectiveness in working with students in integrated classes.

The obtained data show that integrating reflexive practices into the educational process contributes to the development of self-analysis skills in Mining and Metallurgy students. Combining technical content with linguistic components, particularly English language instruction, is particularly effective.

Developing the reflexive competence of technical university students through integration technologies is a crucial direction in the modernization and digitalization of education. The implementation of a complex of pedagogical conditions and the use of active teaching methods ensure the development of professional reflection ability, which contributes to improving the quality of specialist training.

CONCLUSION

The study confirms that reflective competence is an essential component of professional training for students of technical universities. It contributes to the development of self-awareness, critical thinking, independent learning, and the ability to evaluate and improve professional performance. Reflective competence enables future engineers and technical specialists to adapt effectively to technological innovations and the dynamic requirements of the labor market.

The findings indicate that the successful formation of reflective competence requires the integration of reflective practices into the educational process through project-based learning, problem-solving activities, self-assessment, peer assessment, and the use of digital learning tools. Creating a supportive educational environment that encourages self-analysis and continuous improvement plays a crucial role in this process.

In conclusion, the development of reflective competence should be considered one of the strategic objectives of technical higher education. Strengthening this competence not only enhances students' academic achievements but also increases their professional readiness, adaptability, and competitiveness in the modern knowledge-based economy.

REFERENCES

1. Dewey, J. *How We Think*. – Boston: D.C. Heath and Company, 1933. – 301 p.
2. Schön, D. *The Reflective Practitioner: How Professionals Think in Action*. – New York: Basic Books, 1983. – 374 p.
3. Kolb, D. *Experiential Learning: Experience as the Source of Learning and Development*. – Englewood Cliffs, NJ: Prentice Hall, 1984. – 256 p.
4. Mezirow, J. *Transformative Dimensions of Adult Learning*. – San Francisco: Jossey-Bass, 1991. – 247 p.
5. Vygotsky, L. *Mind in Society: The Development of Higher Psychological Processes*. – Cambridge, MA: Harvard University Press, 1978. – 159 p.
6. Hattie, J., Timperley, H. The power of feedback // *Review of Educational Research*. – 2007. – Vol. 77, № 1. – P. 81–112.
7. Moon, J. *Reflection in Learning and Professional Development: Theory and Practice*. – London: Kogan Page, 1999. – 224 p.
8. Muslimov, N.A. *Kasbiy ta'lim pedagogikasi*. – Toshkent: Fan va texnologiya, 2016. – 312 b.
9. Jo'rayev, R.X. Oliy ta'lim tizimida kompetensiyaviy yondashuv asoslari // *Pedagogik ta'lim*. – 2018. – № 3(2). – B. 15–21.
10. Nishonaliyeva, O'N. Talabalarda refleksiv kompetensiyani rivojlantirishning pedagogik omillari // *Xalq ta'limi*. – 2020. – № 5. – B. 44–49.
11. UNESCO. *Rethinking Education: Towards a Global Common Good?* – Paris: UNESCO Publishing, 2015. – 85 p.
12. OECD. *Future of Education and Skills 2030*. – Paris: OECD Publishing, 2019. – 203 p.
13. Khutorskoy, A.V. Klyuchevye kompetensii kak komponent lichnostno-orientirovannoy paradigmy obrazovaniya // *Narodnoe obrazovanie*. – 2003. – № 2. – S. 58–64.
14. Zimnyaya, I.A. *Klyuchevye kompetentnosti kak rezultat sovremennogo obrazovaniya*. – Moscow: Issledovatel'skiy tsentr problem kachestva podgotovki spetsialistov, 2004. – 42 s.
15. Zimmerman, B. *Becoming a self-regulated learner: An overview* // *Theory Into Practice*. – 2002. – Vol. 41, № 2. – P. 64–70.