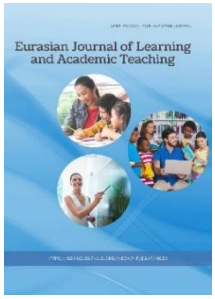

Developing Students' Information Management Competences Based On Case Studies Technology In Practical Training Lessons

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ABSTRACT

This article examines the scientific, theoretical, and methodological foundations for developing student competencies in data management through case study-based practical training in the context of digitalization in agriculture. It describes the stages of case study development, the practical training algorithm, assessment criteria, levels of competency development, and mechanisms for evaluating the results of experimental tests.

Keywords: case study, practical training, digital agriculture, data management, competency, analysis, GIS, IoT, big data.

Introduction. The agricultural sector is currently undergoing rapid digital transformation. Sensors, geographic information systems, satellite monitoring, and big data analysis are widely used within the "smart agriculture" concept. The Food and Agriculture Organization of the United Nations (FAO), in particular, emphasizes the importance of digital technologies in ensuring food security and supporting sustainable agricultural development.

At the same time, modern agricultural machinery manufacturers, particularly John Deere (http://deere.com/), are implementing control systems based on sensor data using precision farming technologies.

These processes require a fundamental update of the content and methodology of higher agricultural education. In particular, developing student competencies in data management is becoming a priority.

1. Content and Structure of Data Management Competency

Data management competency is a student's ability to purposefully and effectively work with data in a digital environment.

It consists of the following structural components:

Cognitive component – knowledge of data types, understanding of agricultural data sources, and understanding of the fundamentals of digital analysis.

The practical component involves data collection, the use of spreadsheets and analytical programs, and visualization.

The analytical component involves comparison, forecasting, and drawing conclusions.

The reflective component involves assessing one's own performance and analyzing the effectiveness of decisions made.

2. Pedagogical Foundations of Case Study Technology

Case study is a teaching method aimed at developing knowledge and skills through the analysis of a specific real-life or simulated situation (problem).

"Case" means a situation;
"Research" means research, analysis.
Thus, case study is a teaching method through in-depth analysis of a specific practical situation.
This method was first used in business education at Harvard University in the early 20 th century and subsequently became widespread in pedagogy, medicine, law, engineering, and other fields. The key features of a case study are the presentation of a real or near-real problem, the possibility that there may not be a single, definitive solution, the need for analysis, discussion, and decision-making, the organization of group work, and the development of critical thinking.
Case study technology is the process of systematic, step-by-step, and methodologically consistent application of the case study method. In other words, while case study is a simple method, case study technology is a purposefully planned, didactically sound, step-by-step approach developed with evaluation criteria in mind, results-oriented, and comprehensive.
The stages of case study technology include: problem presentation, situation analysis, data processing, development of solution options, decision-making, reflection, and evaluation.
Here's an example of a case for a practical lesson in agricultural education: the problem is: "Optimizing an irrigation schedule based on soil moisture sensor data."
Students analyze information, create graphs, make forecasts, calculate economic efficiency, and make decisions. In this process, their data management competencies develop.
Case study is an interactive educational technology based on the analysis of a real or simulated situation. Case study technology develops problem-solving thinking, develops independent decision-making skills, improves teamwork skills, and connects theory with practice. In agriculture, it is important that cases be based on digital data. In the context of digital transformation, the modernization of the higher education system is being reorganized based on a competency-based approach.
This study presents a comprehensive analysis of data management competencies from pedagogical, psychological, and methodological perspectives. The use of case study technologies in practical training promotes the development of students' analytical thinking, independent decision-making skills, and digital literacy.

3. Methodology for organizing practical exercises

Stages of case development.
1. Selecting a problem (e.g., irrigation efficiency).
2. Creating a real database.
3. Formulating problematic questions.
4. Considering solution options.
Practical Exercise Algorithm
Stage 1: Presenting the problematic situation
For example: "Develop an optimal irrigation schedule based on available soil moisture sensor data."
Stage 2: Data processing
Students sort the data, remove outliers, create tables and charts.
Stage 3: Analysis - identifying trends, calculating correlations, and forecasting.
Stage 4: Decision making - justifying the decision and calculating cost-effectiveness.
Stage 5: Discussion and reflection
Groups make presentations and compare results.

4. Case Types

1. Analytical case (based on statistical data).
2. Strategic case (development plan development).
3. Forecasting case (performance forecasting).
4. Innovative case (proposal of a digital solution).
5. Evaluation system
Evaluation criteria: accuracy of data processing, depth of analysis, quality of visualization, validity of the solution, effectiveness of teamwork.
6. Results of Experimental Work (Theoretical Model)
As a result of practical exercises organized around case studies, students' analytical thinking improves, their level of digital literacy increases, their ability to make independent decisions develops, and theoretical knowledge is combined with practical experience.
7. Problems and Solutions

Problems include a lack of technical resources, a limited real-world database, and low digital competence among faculty.

Solutions include creating virtual laboratories, collaborating with agricultural clusters, and professional development for faculty.

Conclusion. The use of case studies in practical classes is an effective mechanism for developing student data management competencies in the context of the digitalization of agriculture. Working with real agricultural data, analyzing it, and making informed decisions prepares students for work in a modern digital environment.

Case-based learning is an effective pedagogical technology that combines theory and practice and serves to prepare competitive and highly qualified specialists in the field of agriculture.

References.

1. Decree of the President of the Republic of Uzbekistan on the "Digital Uzbekistan – 2030" strategy.
2. Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030 – Agricultural Transformation 2030 – electronic text.
3. Address of the President of the Republic of Uzbekistan Shavkat Mirziyoyev to the Oliy Majlis and the people of Uzbekistan. December 26, 2025.
4. Noraliev N.Kh., Kusharov Z.K. Information Technologies in Agriculture. Textbook. Economics and Finance. – T.: 2017. – 521 p.
5. Food and Agriculture Organization of the United Nations (FAO). Digital Agriculture: Farmers of the Future. – Rome: FAO Publishing House, 2020. – 112 p.
6. Lemeshko T.B. Continuing Professional Education in Digital Training of Agro-Industrial Complex Personnel // Chayanov Readings. Proceedings of the 1st International Scientific and Practical Conference on the Problems of Agrarian Economy Development. Moscow: Scientific Consultant, 2020. pp. 270-275.
7. Lemeshko TB Directions for the Development of Continuing Professional Agricultural Education in the Context of Digital Transformation // Business and Design Review. 2021. № 3(23). p. 15.
8. Tsarapkina Yu.M. Information Technologies and Professional Self-Determination of Young People: Monograph / Yu.M. Tsarapkina / Irkutsk: OOO Megaprint, 2017. – 208 p.
9. Tsydypov R.Ts. "Competent Course in the Professional Training of Future Agricultural Specialists", Bulletin of the Buryat State University., 2013, № 15., pp. 183-185.
10. Zeer E.F., Zavodchikov D. Identification of the Universal Competence of Graduates-Employers // Higher Education in Russia / - 2007. - № 2.
11. D. Buranova, R. Dzhurakulov. "Methodology and Competence: Interrelation", UzMU News Bulletin of NUUZ ACTA NUUZ. 2024, [1/9] ISSN 2181-7324. http://journals.nuu.uz Social Sciences.
12. Buranova.D. "Professional and Communicative Training of Students of Agricultural Higher Educational Institutions". "Economy and Society" № 3 (118). 2024. ISSN: 2225-1545; 2541-9285. www.iupr.ru. pp. 101-105.
13. Buranova.D. "On the Issues of Improving the Competence of Future Agricultural Specialists", "Teacher and Continuous Education", ISSN 2181-7138. Issue 4, July, Nukus-2024. Karakalpakstan. pp. 132-135.
14. Buranova.D. "Some Problems of Developing the Professional Competence of Future Agricultural Specialists",Science and Education in Agriculture,July 2024, Volume 7, Issue 7.ISSN: 3030-3222, OAK.http://www.seagc.andqxai.uz. pp. 41-44.
15. Zakirova F.M., Buranova, D.A. "Development of Professional Competence of Students Majoring in Agricultural Specialties," "Scientific Research, Innovations, Theoretical and Practical Strategies." Republican

Interdisciplinary Scientific Conference. March 2025, pp. 19-22.
16. Buranova, D.A. "Competency-Based Approach in the Training of Future Specialists", International Scientific and Practical Conference "New Methods and Innovations in the Integration of Mathematics and Information Technology", April 18, 2025. https://doi.org/10.5281/zenodo.15286133., pp. 240-242.
17. Buranova, D.A. "On the Formation of a Modern Model of Graduate Training Based on a Competency-Based Approach", September 2025. Volume 9, Issue 9 / Journal of Science and Education in Agriculture. QXAI. pp. 68-72.
18. Buranova D. A. "Relevance of Developing Digital Competencies of Future Agricultural Specialists", "Advanced Research in Education" — International Scientific and Methodological Journal. No. 1/-2/2026 ISSN: 3060-527X. №1 — Issue, Part 2, 2026. www.fanistiqbollari.uz, pp. 302-307.