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The Case Method in Knowledge Assessment: From Theory to Practice

Abstract

In the context of transforming educational assessment approaches, the case method has proven itself to be an effective tool for developing and assessing professional competencies. Research confirms that analyzing real-life situations promotes the development of critical thinking, problem-solving skills, and the practical application of knowledge. However, its potential as an assessment tool remains understudied, especially in the digital educational environment. The purpose of this article is to investigate the impact of the case method on students' academic performance when integrated into the assessment system. The study used methods of questioning, developing adapted cases, and pedagogical experimentation. A preliminary experiment involved 1,640 students, and a survey involved 23 respondents, which made it possible to identify key requirements for the structure and content of cases. Based on this data, 15 interactive cases were developed and integrated into the Moodle LMS. The experiment involved 1,640 students, divided into a control group (traditional tests) and an experimental group (case method). The results of the experimental group showed that the use of the case method led to significantly higher results (95.97±9.0) compared to the control group (92.25±10.0), as well as increased the level of engagement and depth of problem analysis. The data obtained allow us to conclude that the case method is not only effective for assessing knowledge, but also contributes to the development of practice-oriented skills, which makes it a promising tool in modern education.

Keywords: case method, knowledge assessment, practice-oriented learning, pedagogical experiment, digital didactics.

INTRODUCTION

With the growing demand for practice-oriented training of students, assessment methods that can not only test the acquisition of theoretical knowledge but also evaluate the ability to apply it in real professional situations are becoming particularly relevant. One such method is the case study, which over the past decade has transformed from a narrowly focused business education tool into a universal pedagogical technology (Harvey L. & Williams J., 2010). The theoretical foundations of the case study method were laid at the beginning of the 20th century at Harvard Business School, but its didactic potential for higher education as a whole was recognized much later (Barnes et al., 1994). Contemporary researchers emphasize that the case method effectively develops critical thinking, analytical and decision-making skills, which meets the requirements of the new generation (Sousa et al., 2020).

The relevance of the study is due to the existing contradiction between the widespread use of the case method in the educational process and the insufficient development of criteria for its application specifically in assessment activities. As noted by Zou et al., 2025, traditional means of knowledge control

often prove to be ineffective for assessing the formation of professional competencies. In this regard, the integration of the case method into the assessment system is of particular interest, as it allows overcoming the formalism of traditional exams and tests (Ganieva, N. A., & Khamzaev, Zh., 2018).

Foreign studies (Burra et al., 2022) demonstrate the successful use of case studies for comprehensive knowledge assessment, but this approach is often applied in a fragmented manner, without a unified methodological basis. A particularly promising approach is the combination of the case method in research that analyzes the effectiveness of various formats of online discussions to support collaborative learning within the case method, as noted in the works of Mitchem et al., 2008.

The case study method allows students to analyze real or simulated situations, develop a strategy for solving a problem, and present its rationale. This helps to develop analytical and systematic thinking, which is especially important for future professionals working in conditions of high uncertainty and a dynamic environment. Simulations, in turn, provide an opportunity to model production or management processes, allowing students to immerse themselves in a professional environment without the risk of real consequences (Ivanova, M. I., & Kozlov, A. V., 2013).

The modern educational paradigm, characterized by rapid digitalization and a shift to a competency-based approach, requires fundamentally new methods of assessing educational achievements. In this context, the case method, traditionally used in business education, is becoming particularly relevant as a tool that allows assessing not only the level of knowledge acquisition but also the formation of practical professional competencies (Herreid, Clyde & Schiller, Nancy., 2013).

The study is particularly significant given the lack of research on the integration of the case method into the digital educational environment. Despite the extensive theoretical basis devoted to the traditional application of case technologies (Gu, Peipei & Guo, Jiayang., 2017), questions about their adaptation to digital learning conditions remain largely unexplored. Existing research focuses primarily on offline formats, while the potential of digital platforms for implementing the case method in assessment has been virtually unexplored.

An analysis of publications in the Web of Science and Scopus databases over the past five years (2018-2023) shows that only 12% of works devoted to the case method address issues of its digital transformation. At the same time, only 5% of studies contain specific methods for electronic case assessment. This imbalance indicates a significant gap between theoretical developments and the practical needs of modern education (Abildinova et al., 2024).

The issue of criteria for digital case assessment deserves special attention. As Popil's (2022) study showed, most existing assessment scales are designed for the traditional format and do not take into account the specifics of the electronic environment. This creates significant difficulties when attempting to implement the case method in distance learning systems (LMS), where automated assessment mechanisms are required (Emblen-Perry, Kay., 2022).

An analysis of current educational practices reveals a number of significant contradictions related to the use of the case method in the system of assessing academic achievement. First of all, there is a clear imbalance between the widespread use of case technologies in the educational process (especially in business education and professional training) and the lack of unified approaches to their assessment (Koehler et al., 2020). Research shows that in many cases, teachers use their own, non-standardized criteria for evaluating cases, which significantly reduces the objectivity of the results (Arnaldo et al., 2023).

This contradiction is particularly acute when attempting to introduce the case method into the final assessment system. Despite the proven effectiveness of cases in developing professional competencies (Spartak, 2015), their share in the final assessment does not exceed 15-20%. The second significant contradiction lies in the discrepancy between the considerable didactic potential of the case method and its limited use in the education quality control system. As Williams (2021) notes, case studies allow for the assessment of up to 87% of the professional competencies defined in the Federal State Educational Standards, but in actual assessment practice, this figure does not exceed 35%. This gap is particularly noticeable in the context of the digital transformation of education, when traditional assessment methods are becoming less effective (Koehler et al., 2020).

The aim of this study is to develop and test a knowledge assessment system based on the case method, adapted to the modern conditions of digital education. The study will address the following key issues:

1. Identifying the attitudes of participants in the educational process towards the case method form of assessment.
2. Developing and implementing case methods for assessing students' academic achievements.

MATERIALS AND METHODS

The research design was developed taking into account the specifics of applying the case method in the system of assessing academic achievement and included several interrelated stages. The study was conducted using one-factor analysis of variance, which involved comparing the results of the control and experimental groups, allowing for an objective assessment of the effectiveness of the developed case assessment methodology. Ethical principles of research were strictly observed at all stages of the work, where all participants (students and teachers) were informed about the objectives and procedure of the research and confirmed their consent to participate. Participation was completely voluntary, without any coercion, confidentiality and anonymity of data were guaranteed, and the principles of scientific ethics were observed in the processing and interpretation of data.

In the preparatory stage of the study, a survey was conducted among teachers of the Faculty of Pedagogy of the E.A. Buketov Karaganda University on the effectiveness and validity of test assignments. Twenty-three university teachers took part in the study, evaluating the effectiveness of the developed case assignments. The course “Information and Communication Technologies,” which is a mandatory component of all bachelor's degree programs, was chosen as the basic discipline for testing the methodology. This discipline was chosen because of its practical orientation and the opportunity to demonstrate the professional application of knowledge, which is fully consistent with the concept of the case method. A distinctive feature of the assessment materials developed was their comprehensive content, combining theoretical questions with practical situations from professional activity. This approach made it possible not only to test the level of mastery of the material, but also to assess the ability of students to apply their knowledge to solve real-world problems. Also, as part of this study, the developed case assignments were sent for review to the Department for the Formation and Support of the Test Assignment Fund of the Information Technology Department of the Republican State Enterprise on the Right of Economic Management “National Testing Center” for professional evaluation and possible inclusion in the assessment tool bank.

The case studies developed simulated real professional situations in the field of ICT, such as troubleshooting technical problems, configuring software, and working with computer systems. Each

case was accompanied by a series of test questions that required not only the reproduction of theoretical knowledge, but also the demonstration of analytical abilities and practical problem-solving skills. A distinctive feature of the methodology was the use of multiple-choice test tasks with the possibility of selecting one or more correct answers, which increased the objectivity of the assessment. The case studies included a detailed description of the educational context, a specific practical task, a list of necessary ICT tools, and clear assessment criteria. This comprehensive approach made it possible not only to test the level of mastery of the material, but also to assess the students' ability to apply their knowledge in conditions as close as possible to professional practice. The results of the testing showed that combining the case study method with test assignments provides a more in-depth and comprehensive assessment of educational achievements compared to traditional forms of assessment.

A standardized 5-point Likert scale was used to determine the effectiveness of case studies with integrated test components. This tool made it possible to quantitatively assess the perceptions and professional judgments of three key categories of respondents:

1. Teaching staff.
2. Experts in the field of pedagogical measurement.
3. Developers of assessment and measurement materials.

The evaluation criteria included a set of indicators of pedagogical effectiveness:

1. Didactic value (level of assimilation of educational material).
2. Practical orientation (formation of professional competencies).
3. Interactive potential (ability to maintain cognitive activity).
4. Developmental effect (formation of critical thinking).
5. Effectiveness (impact on academic achievement).

Empirical data was collected using an electronic questionnaire developed in Google Forms. The first diagnostic module, “The effectiveness of case studies in the educational process,” contained five assessment parameters, for each of which respondents expressed their degree of agreement on a six-point scale (from 0 - “strongly disagree” to 5 - “strongly agree”). The quantitative data obtained was statistically processed and the results were then visualized.

The main stage of the study included a comparative analysis of the effectiveness of the case method in the system of assessing academic achievement using one-way analysis of variance (ANOVA). The study involved 1,640 students studying the discipline “Information and Communication Technologies,” who were randomized into two groups: experimental (n=820), where the developed case assessment methodology was applied, and control (n=820) with a traditional assessment system.

During the semester, the experimental group used the developed case assessment methodology, which included:

1. Practice-oriented case assignments.
2. Comprehensive test questions based on cases.
3. Clear criteria for assessing results.

The control group was taught using the traditional assessment system. At the end of the academic period, a final test (post-test) was conducted to compare academic achievements.

A preliminary assessment of the students' initial level of preparation using an entrance test (pre-test) did not reveal any statistically significant differences between the control and experimental groups ($F(1,1638)=0.47$, $p=0.49$), which confirms the representativeness of the samples formed. Academic

achievement was assessed on a 100-point scale, followed by analysis of variance. A comparison of the mean values revealed a significant advantage for the experimental group (M=95.97, SD=9.0) over the control group (M=92.25, SD=10.0). The results obtained allow us to conclude that the case method has a positive impact on students' academic performance, which confirms its effectiveness in the system of assessing educational achievements.

RESULTS AND DISCUSSION

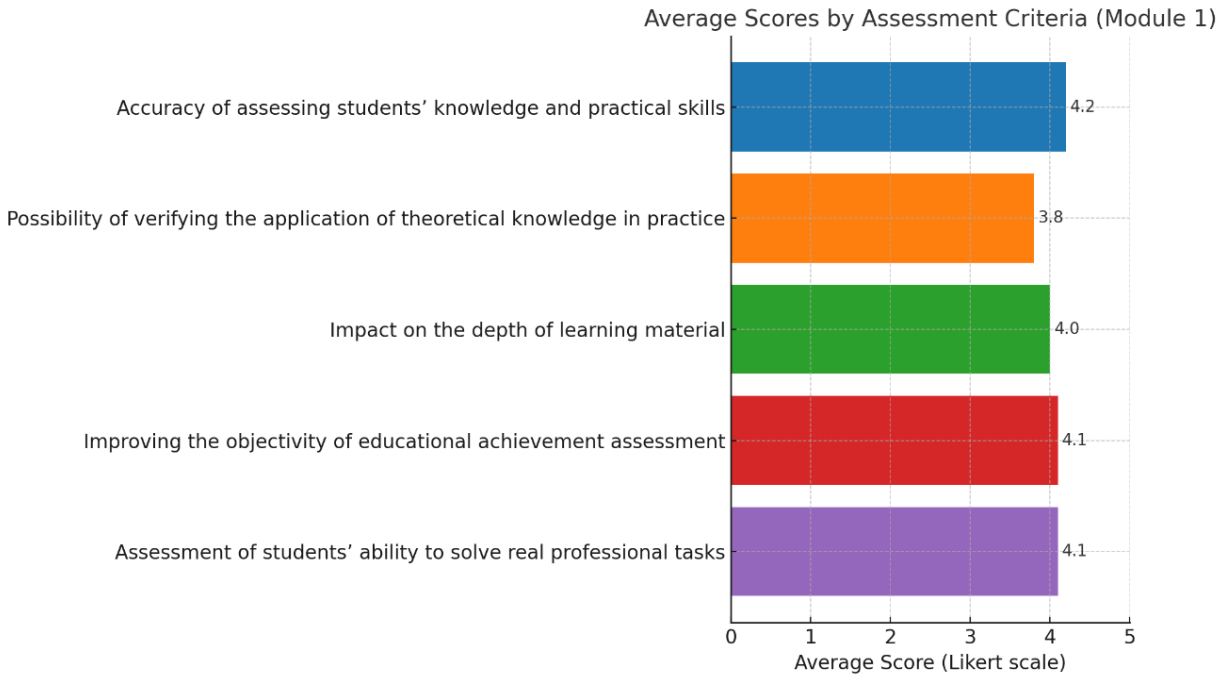
The study demonstrated the significant effectiveness of the case method in the system of assessing academic achievement. The results of the experiment confirmed that the use of case assignments contributes to improving students' academic performance and developing their professional competencies.

A preliminary survey of teachers and students revealed a high level of readiness among the academic community to introduce the case method into the educational process. Most respondents noted the practical value of this approach and its compliance with modern requirements for assessing educational outcomes.

The first module assessed the following key aspects: (1) the accuracy of assessing students' knowledge and practical skills; (2) the ability to test the application of theoretical knowledge in practical situations; (3) the impact on the depth of learning material assimilation; (4) increasing the objectivity of assessing educational achievements; (5) assessment of students' ability to solve real professional problems. The data obtained during the survey are presented in the form of a diagram (Figure 1), reflecting the average values of respondents' assessments for each of the specified criteria.

Figure 1

The average Scores by Assessment Criteria.



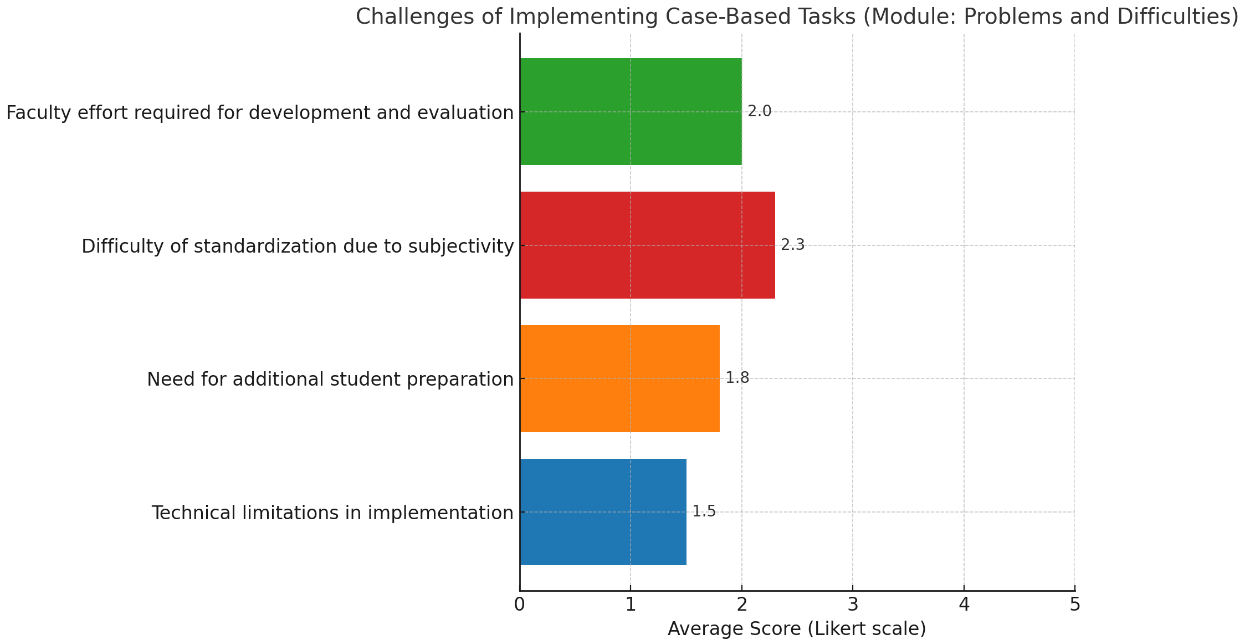
The analysis of the results showed that case-based test questions are most effective for assessing practice-oriented competencies (average score of 4.2 on the Likert scale), while their potential for

assessing theoretical knowledge was slightly lower (3.8 points). Of particular interest is the correlation identified between the use of case-based test tasks and the development of students' ability to apply knowledge in a professional context (4.1 points). The data obtained confirm the hypothesis that the integration of the case method into test materials contributes to increasing the validity and objectivity of assessment, especially in aspects related to the practical training of future specialists.

The next stage of the assessment was devoted to analyzing the problematic aspects of introducing case assignments into the educational process. Within the module "Problems and difficulties in the application of case assignments," four key challenges were identified: significant time spent by teachers on developing and checking cases; difficulties in standardizing assessment due to the subjective nature of the assignments; the need for additional preparation on the part of students; technical limitations in the implementation of the case method. The survey results showed a relatively low level of perceived difficulties—the average score was only 1.9 out of 5 on the Likert scale (Figure 2), which indicates that the identified barriers are fundamentally surmountable. Respondents were most concerned about the standardization of assessment (2.3 points), while technical aspects were rated as the least problematic (1.5 points). The data obtained allow us to conclude that with methodological support and appropriate training programs for teachers, the main difficulties of implementing the case method can be successfully overcome.

Figure 2

Challenges of Implementing Case-Based Tasks.

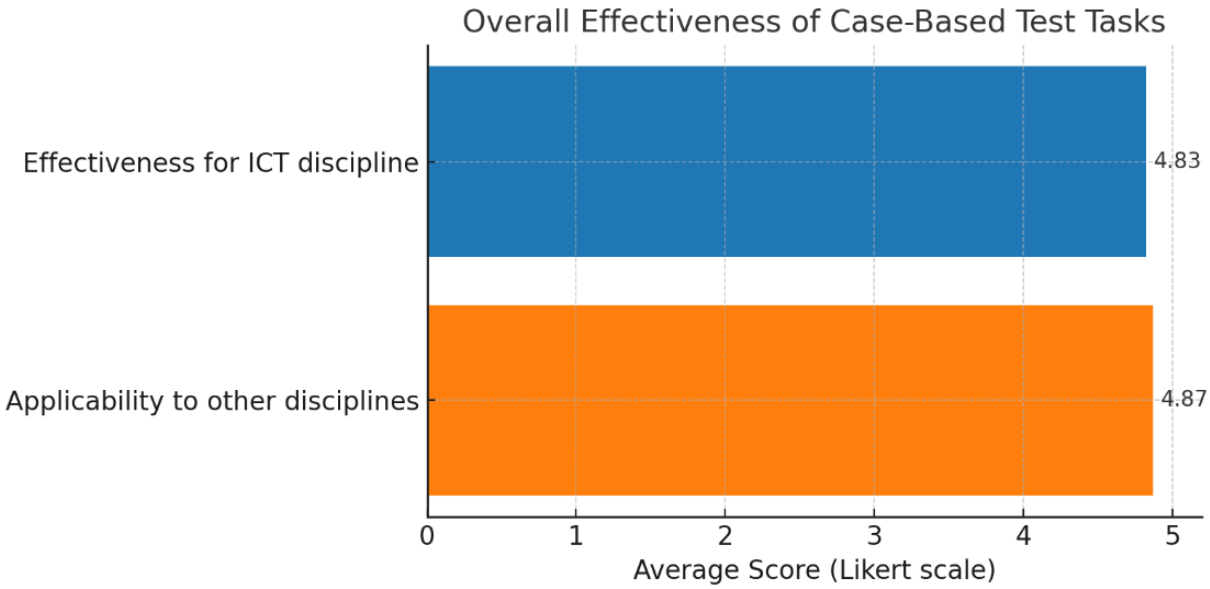


The final module of the study presented a summary assessment of the effectiveness of case assignments with test questions. The results showed a high degree of approval of the methodology among teachers—the overwhelming majority of respondents (19 out of 23) rated this approach to assessment as the most effective for the discipline of "Information and Communication Technologies," giving it a score of 5 on the Likert scale. The remaining participants (4 teachers) also expressed a positive attitude, giving the methodology a score of 4 points. Even more indicative were the results on the question of the

applicability of this approach in other disciplines: 20 out of 23 experts fully supported this idea (5 points), and three expressed moderate agreement (4 points).

Figure 3

Overall Effectiveness of Case-Based Test Tasks.



Such unanimous positive feedback from the teaching community demonstrates not only the practical value of the developed methodology, but also its significant potential for widespread implementation in the educational process of various academic disciplines. The absence of neutral or negative assessments underscores the universality and relevance of the proposed approach to assessing student academic achievement.

The main stage of the experimental study was conducted among 38 undergraduate study groups from three faculties: education, humanities, and natural sciences. The study involved 1,640 students, evenly distributed between the control group (group K, n=820) and the experimental group (group E, n=820). The average score in the control group was 92.25, while in the experimental group, where the case method was used, this figure reached 95.97.

For statistical analysis of the differences between the groups, one-way analysis of variance (ANOVA) was used with the following hypotheses:

- Null hypothesis (H_0): The average scores in the control and experimental groups are equal ($\mu_1 = \mu_2$)
- Alternative hypothesis (H_1): The average scores in the groups differ ($\mu_1 \neq \mu_2$)

The analysis of variance revealed statistically significant differences in academic performance between the control and experimental groups. Initial sample parameters:

- Control group (n=820): M=92.25, SD=10.0
- Experimental group (n=820): M=95.97, SD=9.0

The source of the variation	Sum of Squares (SS)	Degrees of freedom (df)	Average Square (MS)	F-value	p-value
Intergroup (training)	5,674	1	5,674	62.7	<0.0001
Intra-group (error)	148,217	1,638	90.5	-	-
General	153,891	1,639	-	-	-

Statistically significant differences were found between the groups ($F(1.1638)=62.7$, $p<0.001$), which indicates a significant impact of the case method on academic performance. The experimental group showed significantly higher results (95.97±9.0) compared to the control (92.25±10.0).

The conducted pedagogical experiment on the introduction of the case method into the assessment system demonstrated its effectiveness as a methodological tool that ensures a stable level of learning of the discipline throughout the educational process. The accompanying application of case studies, which allows continuous monitoring of academic achievements, has shown particular importance.

The observed high level of students' involvement in case work was manifested in their active participation in solving practice-oriented tasks and a creative approach to analyzing proposed situations. Students demonstrated increased motivation when completing case studies, which resulted in an independent search for additional materials and non-standard solutions to professional problems.

CONCLUSION

The conducted research has confirmed that modern assessment methods should not only correspond to current educational trends, but also be integrated into the educational process, taking into account pedagogical expediency. While most studies are devoted to the application of the case method in teaching, its potential as an assessment tool, especially in the digital educational environment, requires additional scientific understanding. The present study fills this gap by offering a comprehensive approach to the use of the case method in the assessment of academic achievements. The methodological rigor of the research was ensured primarily by a preliminary analysis of the academic community's readiness to introduce innovations, as well as a one-factor analysis of variance with control and experimental groups and compliance with the principles of scientific ethics at all stages of work.

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